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PRINCIPAL CONTENTS

	PAGE
Features	
Leader: The Institute's Proceedings	291
Correspondence	292
Parliamentary	298
Notes from the Branches	302
Book Reviews	310
New Equipment	311
Forthcoming Events (Advert. section)	37
Technical	
Cost Factors in Electric-furnace Operation, by F. S. Leigh	293
Estimation and Influence of the Gaseous Elements in Cast Iron, by L. W. L. Smith, B. B. Bach, and J. V. Dawson	303
News	
Ambassador's Visit to Sheffield Steelworks	292
Census of Production, 1954	313
Personal and Obituary	314
Raw Material Markets	320
Statistics	
Current Prices of Iron, Steel and Non-ferrous Metals (Advert. section)	36

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The Institute's Proceedings

Volume 46 of the *Proceedings* of the Institute of British Foundrymen has now been issued and causes us to comment that the word "volume" has no special significance as to periodic publication. This issue as it happens covers the 50th annual general meeting of the Institute, including its forerunner the British Foundrymen's Association. The first volume to carry a volume number was in 1921, when the Royal Charter was granted, and this one was labelled vol. 15. Thus it would seem that the first volume covers the year 1907-8. Volume 46 is much of the same size as last year's and, as usual, faithfully mirrors current thought, trends and practice. What is likely to happen in foundries of the future is splendidly set out in Mr. E. W. Colbeck's "Edward Williams" Lecture. The lot of the foundryman is likely to be increasingly onerous, as there are bound to be as yet inattainable requirements from his products. Some consolation, however, is accorded in that parallel with these developments will come added scientific aids to production. What has happened in the past, in one sphere of activity—textile machinery—is dealt with in the *Proceedings* in a most interesting manner and shows clearly that this type of development will continue. For current developments, there are papers on shell moulding, pressure-cast aluminium pattern equipment, dust control on grinding machines, new phases of cupola design and operation, and economic swarf utilization. The non-ferrous section of the industry is represented by four papers, but steelfounding has only two and malleable but one. This is no fault of the Institute, as, each year, contributions are invited from each section—it means, probably, that there was nothing available at the time of the request. Technical papers have a habit, like main-road traffic, of coming in bunches. It is fortunate that all branches of the foundry industry have many common problems and we estimate that there are in this volume at least a dozen papers of general interest.

We esteem very highly the report of the "Symposium on Runners and Risers." This subject is regarded by most (perhaps wrongly) in its purely practical conception. However, evidence is forthcoming that the subject is lending itself to scientific treatment and the future will see the enunciation of basic principles capable of correlation with the properties of the alloy being cast and the mould material used. Obviously, there will always be a large number of variables, the significance of which will call for the mature judgment of the foundryman. On this subject, a recent Paper to the Lancashire branch of the Institute by Mr. Ruddle really gets down to the core of the matter. The selection for inclusion in the *Proceedings* of Papers given before the branches is based upon an assessment of their worth, but, unfortunately, limitations of space rules out a few of those otherwise eminently suited for inclusion.

The *Proceedings* are this year printed on a new type of paper and the pictures appear to us to show up better than in earlier editions. The book has been splendidly edited and indexed by Mr. Lambert and we note with pleasure the constant improvement over the years, as experience is gained both in this office and in Manchester. We would, however, make a special plea to speakers participating in discussions to ensure that their names are given (and identity in the case of "Smith's" and "Jones's") so that a fair chance is given of proper checking and recording. We deem this issue to be both a credit to the Institute and the industry which it serves so admirably.

Correspondence

SCOTTISH CONFERENCE FUND

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—On behalf of my committee, I am enclosing for publication* the first list of donations received for the 1954 Conference Fund of the Institute of British Foundrymen. The total of £4,117 subscribed by Scottish industry most surely reflects the great interest taken in the affairs of the Institute and, in particular, appreciation of the qualities of the president-designate, Mr. John Bell.

The Conference Fund treasurer, Mr. A. Marshall, has acknowledged all contributions received, but the Conference Committee would like to take the opportunity of expressing, through your columns, their gratitude to those firms and individuals who responded so generously to their appeal for funds. Thanks are also due to those from outside Scotland who offered donations which, regretfully, we were unable to accept, but the sincerity of their offers was much appreciated.

The financial success of the conference being assured at this early date makes the work of the Committee so much easier, and I take this opportunity, on behalf of the Conference Committee and Scottish branch council, of expressing thanks to all who have made this possible.—Yours, etc.,

RONALD TAYLOR,
Convener, Scottish Conference Committee.

* See page 297 of this issue.

Metrovick Appointments

Metropolitan-Vickers Electrical Company, Limited, announces that as from March 1 Dr. C. Dannatt has been appointed deputy managing director. He has been assistant managing director since August, 1951. Mr. J. F. Perry, managing director of Metropolitan-Vickers Electrical Export Company, has been appointed a director of the parent company. Mr. Arthur C. Main, director and works manager, Trafford Park Works, has been appointed director of manufacture. Mr. E. W. Steele, hitherto director and general manager of works, retires from executive duties but remains a director of the company.

Index to Vol. 95

The index to the JOURNAL, volume 95, covering the period July 2 to December 31, 1953, has now been printed and is available to readers free of charge. Applications for copies should be addressed to the publishing office, FOUNDRY TRADE JOURNAL, 49, Wellington Street, London, W.C.2. Subscribers who wish to receive copies of indices automatically as they are printed may apply for inclusion on a permanent mailing list. Those already on this list should not need to apply for their current copy.

"National Society of Master Patternmakers"

It is regretted that in last week's issue a note announcing the formation of a representative body of master patternmakers was wrongly entitled "National Patternmakers' Association." Although the organization is indeed envisaged on a national basis, the title adopted at the inaugural meeting is that quoted at the head of this paragraph.

Ambassador's Visit to Sheffield Steelworks

After a visit to the steelworks of the English Steel Corporation, Limited, recently, Signor Manlio Brosio, the Italian Ambassador, said that although he had inspected a number of similar undertakings in Italy, he had seen nothing so efficient and impressive as the Sheffield works. Signor Brosio said that he was glad to see that Italy's confidence in liberalizing trade by 99 per cent. had been justified by Britain's liberalizing hers to the "very substantial" extent of 78 per cent. Despite the fact that her own steel production had increased, Italy still imported steel, particularly special steel, as well as some finished products and cutlery from Sheffield.

Addressing an audience of staff and students of Sheffield University, Signor Brosio said that the development of the Italian steel industry since the war had now increased output to a point which made it reasonably strong. In 1946 the country's production of steel was barely half that of pre-war years. Greater efficiency, modernization, and construction of new plant had raised output of crude steel to 3,500,000 tons in 1952-53, an increase of 5 per cent. over 1948. The development was still going on, and one of the largest and most up-to-date plants was nearing completion. This would produce about 500,000 tons annually. He added that under a recent agreement between an Italian firm and an American group, enough stainless steel would be manufactured in Italy to leave some for export over and above her own needs.

Output of electricity in Italy had increased by 60 per cent. on the pre-war figures, and since the war there had also been the development of natural gas as a source of power. Since the harnessing of natural gas, the rise in output had been spectacular, and it was now producing power equal to about 4,500,000 tons of coal a year.

Factory Equipment Exhibition

At the Factory Equipment Exhibition (March 22 to 26) at the Horticultural Halls, Westminster, London, stand 141 is occupied by Sturtevant Engineering Company, Limited, exhibiting various sizes of industrial vacuum cleaners. The range shown includes Nos. 3, 4 and 5 sizes; also No. 6x7, a truck-mounted cleaner, dating two operators simultaneously on heavy industrial cleaning, and No. 6x11, which is typical of the larger installations having fixed piping, to provide a cleaning service to all parts of a factory. In addition, a portable elecric dust blower for cleaning in inaccessible places, a "Uniclone" dust-collector, an electrostatic air filter and an axial-flow fan for general ventilation purposes will be shown.

Consett Iron Company, Limited

The third in the series of technical surveys of modern British steelworks prepared by the staff of our sister journal, "Iron and Coal Trades Review," has now been published. It deals with the Consett Iron Company, Limited, and traces the history of the district in addition to providing complete technical data of the design and equipment of the plant. The illustrations include layout and flow diagrams. The issue is obtainable, price 5s., post free, from the Publisher, "Iron and Coal Trades Review," 49, Wellington Street, London, W.C.2.

Cost Factors in Electric-furnace Operation

*By F. S. Leigh, B.Sc.**

The introduction of electric melting furnaces into the ironfoundry industry has proved rather slow hitherto, mainly because of the high capital and operating costs involved. A number of economic factors have arisen, however, which in many cases make electric melting an attractive proposition, particularly for the foundry specializing in high-duty iron castings. The main factors in question are fuel and refractory costs, also cost of pig-iron and scrap and, of course, the quality of the final product. There are a number of electric melting furnaces available at present, the operating characteristics of which are widely divergent. In this article the Author briefly describes these melting units, and critically analyses them respecting (a) capital cost; (b) operating cost; (c) method of use; and (d) metallurgical results.

Direct-arc Furnace

The main features of a modern electric-arc furnace are well-known. Briefly, the melting heat is generated by three arcs which are struck between the electrodes and the charge located inside a roughly hemispherical furnace body. Power input and therefore heat input to the furnace is easily controlled within wide limits (20 or less up to about 125 per cent.). This is achieved by selecting appropriate voltages from a large range provided on the furnace transformer and by controlling the length of arc with the help of an automatic regulator.

The furnace can be acid- or basic-lined depending upon metallurgical considerations. For instance, if only straightforward melting processes are involved and there is no sulphur or phosphorus problem, then a simple and cheap acid lining will be used. On the other hand, a basic lining will be required if slagging operations for removing sulphur and phosphorus are involved. Broadly speaking, the direct-arc furnace is an excellent metallurgical tool suitable not only for melting, but also for the refining of a very wide range of ferrous alloys ranging from plain cast iron and malleable iron to low-carbon stainless steels.

The capital cost depends upon furnace size and output required. A typical foundry unit would be a 3½- to 4-ton furnace powered at 1,500 to 2,000 kva and capable of producing high-quality grey iron at the rate of 2 tons per hour. The furnace would be basic lined and the charge could be of 100 per cent. steel scrap; a mixture of steel scrap and foundry returns or even 100 per cent. pig-iron charges, could also be suitable. Under certain circumstances it might be advantageous to run a campaign with the furnace acid-lined, dealing with foundry returns exclusively during this period. Alternatively, if the foundry is sufficiently large, it may be advisable to have a furnace for the sole purpose of melting foundry returns. In such a case, full advantage would be taken of the lower melting costs and higher outputs resulting from the use of an acid-lined unit. For instance, the same type of furnace as mentioned earlier would be capable of an output up to 3½ tons per hour with an acid lining. The approximate cost of this unit, arranged for top charging, is of the order of £26,000.

*The Author is attached to Birlec Limited.

Operating Costs

The operating costs are determined by direct charges, comprising—in the main—electricity, electrodes, cooling water, refractories, labour, and such indirect costs as supervision, laboratory charges, depreciation, etc. These latter items cannot be assessed by the furnace maker since so much depends upon factors outside his control. With regard to consumption figures and taking the 3- to 4-ton furnace as an example, the following represent fair average values when operating a basic-lined furnace on 100 per cent. scrap charges for the production of iron castings:—

		£	s.	d.
Electricity: 550 to 650 kwh per ton @ 1d. per kwh	=	*2	14	2
Electrodes: 8 to 10 lb. graphite per ton @ 1/10d. per lb.	=		*18	4
Refractories: for sidewalls and fettling: 40 lb. dolomite per ton	=		3	0
Roof refractories: 15 lb. silica per ton	=		4	0
Cooling water: 2,000 gall. per ton	=		1	0
Labour: 1 man/hour per ton ..	=		5	0
TOTAL COST (per ton)		£4	5	6

* Based on the higher values.

When used as a holding or superheating unit, this type of furnace can be used at a more economical rate. For instance, electricity and electrode consumption would be reduced considerably, also the man/hour cost per ton. The following would represent a fair estimate for superheating iron at the rate of, say, 10 tons per hour:—

		£	s.	d.
Electricity: 75 kwh per ton @ 1d. per kwh	=		6	3
Electrodes: 2 lb. graphite per ton @ 1/10d. per lb.	=		3	8
Refractories for sidewalls and fettling: 20 lb. dolomite per ton ..	=		1	6

Cost Factors in Electric-furnace Operation

Roof refractories: 5 lb. silica per ton	=	1 4
Cooling water: 200 gall. per ton ..	=	2
Labour: 1/10 man/hour per ton ..	=	6
TOTAL (per ton)		13 5

The capital costs of an arc furnace designed purely as a superheating and holding unit would also be considerably reduced. For a throughput of 10 tons per hour and with an electrical rating of, say, 600 kva, the capital cost would be of the order of £12,000.

Low-frequency Induction Melting

Two types of low-frequency induction melting furnaces have been developed, known as the "channel" or "submerged-resistor" type and the "coreless" type. The channel type is well-known in the non-ferrous metal industry, where it is widely applied to the melting of copper-base and aluminium alloys. As its name implies, this furnace operates with one or more channels so arranged that heat generated in them by the passage of heavy electrical currents is transferred to the charge contained in the main body of the furnace. The electrical currents are induced in the channels by transformer action at mains frequency. The design of the channels is critical and in order to ensure a reasonable life it is essential that the kw input for a given size be kept at a low value. Consequently, this type of furnace is normally only recommended for holding or superheating molten iron and not for melting from cold. Most foundries will prefer a holding unit which is also capable of melting a limited amount of cold additions (say up to 20 per cent. steel scrap for carbon control) or which can be used for the melting of 100 per cent. cold charges. The coreless furnace has been designed for this purpose.

The low-frequency core-less type of furnace is built up exactly on the same principles as a high-frequency melting unit, except that the electrical energy employed is at normal mains frequency of 50 cycles per sec. An inductor coil made up from heavy copper tubing is used and surrounds a cylindrical crucible of suitable refractories which is rammed into position. Packets of laminated transformer-iron strips are disposed around the inductor coil so as to prevent stray magnetic fields affecting the steel framework of the furnace body. The use of mains-frequency energy in this type of furnace produces a violent stirring effect in the molten bath and care must be taken to design in such a way that excessive turbulence cannot take place. This is particularly important in the case of units designed for melting and which possess a comparatively high electrical rating for a given crucible size.

The furnace refractories employed are usually acid ramming mixtures and this type of equipment is therefore only used as a straight melting and alloying or holding furnace. Basic rammed linings are somewhat more difficult to instal and maintain but can be used under special circumstances. Nevertheless this type—like the high-frequency furnace—must not be looked upon as a metallurgical tool to be used for methods which necessitate extensive slagging or refining operations.

The inherent power factor of these furnaces is low and must be improved with the help of capacitors. In the case of the larger units (say 200 kva rating and upwards) it is also advisable to provide a static balancer in order to distribute the single-phase furnace load equally over a three-phase supply main.

The capital costs of low frequency core-less induction furnaces are governed to a very large extent by their electrical rating and whether the unit is primarily intended for melting or holding duties. A furnace with a capacity of about 6 tons of molten metal and rated at say 1,200 kva would be capable of melting iron at the rate of about 2½ tons per hour. It should be borne in mind that this is a melting rate and not a production rate. The 3- to 4-ton arc furnace quoted in the previous example, for instance, is capable of producing grey iron from 100 per cent. steel-scrap charges at two hour intervals, thus giving a production rate of nearly 2 tons per hour. The same arc furnace, when used purely as a melting unit in the same way as the low-frequency furnace, would melt at the rate of nearly 4 tons per hour.

The cost of the above-mentioned low-frequency furnace would be of the order of £30,000, which figure includes all capacitors and a static balancer.

The same furnace designed as a holding unit, and capable of superheating at the rate of 5 to 10 tons of iron per hour or melting 1¼ tons per hour, would be rated at 750 kva and would cost approximately £21,000. Reducing the electrical rating to 450 kva would halve the above superheating and melting capacity and would reduce the cost of the furnace to approximately £15,500.

The net operating costs, including overheads, when running this unit as a melting furnace would be as follow:—

		£ s. d.
Electricity: 550-600 kwh per ton @ 1d. per kwh	=	*2 10 0
Refractories: acid; ramming mixture	=	2 0
Cooling water: 1,500 gall. per ton	=	9
Labour: ½ man/hour per ton ..	=	2 6
TOTAL (per ton)		£2 15 3

* Based on the higher value.

Alternatively, when operating as a holding and superheating unit the cost would be:—

		£ s. d.
Electricity: 50 kwh per ton @ 1d. per kwh	=	4 2
Refractories: acid, ramming mixture	=	6
Cooling water: 400 gall. per ton ..	=	3
Labour: ⅛ man/hour per ton ..	=	8
TOTAL (per ton)		5 7

TABLE I.—*Furnace Application.*

Furnace type.	Lining.	Application.	
		Melting.	Metallurgical.
Direct-arc	Basic or acid	Steel scrap, Iron scrap, Pig-iron — from cold	Melting; refining, including sulphur and phosphorus removal; holding.
Low-frequency, core-less	Acid	Steel scrap, Iron scrap, Pig-iron — Starting with molten-metal "heel," or special charge	Melting; holding.
High-frequency, core-less	Acid	Steel scrap, Iron scrap, Pig-iron — from cold.	Melting; holding.

The capital costs of a channel-type induction furnace are considerably lower. For instance, a one ton unit capable of superheating iron at the rate of 5 tons per hr. and rated at 150 kw would cost approximately £6,500. The main reason for this reduction is the inherently high power-factor of a channel-type furnace with a consequent reduction of capacitor requirements. Operating costs are also very low, say 6s. per ton of metal throughput. As already mentioned, however, the present-day channel-type furnace has a limited field of application.

High-frequency Furnace

The high-frequency furnace is well-known in the steel industry, where it is used extensively for the production of high-quality alloys such as stainless steels, high-speed tool-steels, etc. The construction of the furnace is extremely simple and consists essentially of an inductor coil surrounding a rammed crucible for holding the charge. The electrical power used for energizing the furnace coil is at a frequency considerably in excess of the normal mains value of 50 cycles and varies, according to furnace size, between 500 to 10,000 cycles per sec. To generate this high-frequency supply it is necessary to provide a suitable converter unit, usually a motor/alternator set, and it is this which makes for the high capital cost of this type of installation. The high-frequency furnace is characterized by high melting rates and a comparatively thin lining. Like the low-frequency furnace, it is not particularly suited to the carrying out of slagging operations and care must be taken, therefore, to ensure that the charge material is of known composition suitable for the end product without the need for refining processes.

Compared with low-frequency furnaces, the main technical advantage of the high-frequency unit is that it is possible to concentrate greater power inputs into a given charge without fear of causing excessive stirring actions. Also, the high-frequency furnace can be started from cold without the use of a special starting charge. Finally, it can be emptied completely after each heat, instead of having to retain a "heel" of molten metal with which to start the next heat, as in the case of a low-frequency furnace. There are no technical difficulties in the use of high-frequency furnaces as holding units. Capacitors for correcting the power factor of the furnace are an essential requirement of a high-frequency installation.

As regards capital costs, it is difficult to present a true picture, since the high-frequency melting furnace caters specially for the high-quality steel trade, where production rates are considerably lower than in the iron foundry industry. For instance, a 400 kw set together with a 10- to 15-cwt. furnace would be capable of melting at the rate of about 12- to 15-cwt. per hour, or a production rate of, say, 12-cwt. per hour. The cost of such an installation would be nearly £30,000 and therefore far in excess of either an arc furnace or low-frequency furnace, either of which would be capable of producing at a considerably greater rate for the same capital expenditure.

As stated, for holding duties the high-frequency furnace would be quite suitable technically, but capital costs would be high, owing to the expenses of providing a high-frequency converter set. For example, a furnace of 6-ton molten metal capacity energized by a 600 kw set would be able to melt at the rate of 1¼ tons per hour or superheat 5 to 10 tons of molten iron per hour. The capital costs

TABLE II.—*Furnace Installation and Operating Costs Summarized.*

Furnace type	Direct-arc.			Low-frequency.			High-frequency.	
Duty.	Acid, melting.	Basic, melting and refining.	Holding, and superheating	Acid, melting.	Holding and superheating.		Acid, melting.	Holding, and superheating.
Rating	2,000 kva	2,000 kva	600 kva	1,200 kva	750 kva	450 kva	400 kw	600 kw
Installation cost	£26,000	£26,000	£12,000*	£30,000	£21,000	£15.500	£30,000	£40,000
Output in tons per hour	3½–4	2	10	2½	10	5	¾	10
Operating cost per ton (excl. overheads and capital charges)	£3 12s. 0d.	£4 5s. 6d.	13s. 5d.	£2 15s. 3d.	5s. 7d.	6s. 3d.	£3 0s. 3d. (approx.)	6s. 0d. (approx.)

* Stationary furnace.

Cost Factors in Electric-furnace Operation

of such a unit would be very high compared with those of a low-frequency furnace of similar size and would be of the order of £40,000.

With regard to operating costs these would be practically identical with those of the low-frequency furnace, except that the energy consumption figures would be some 10 to 15 per cent. higher, in view of the additional losses in converting mains supply to high frequency. The increased capital costs of the high-frequency installation would be reflected, of course, in higher depreciation charges per ton of metal produced in the furnace.

Conclusion

In comparing the three different types of melting equipment available, it is essential to remember that each design has a particular field of application for which it is best suited, and that a direct comparison of either capital or operating cost figures may lead to an incorrect assessment of the value of any particular furnace for any particular duty. Tables I and II set out some of the main characteristics involved. It will be seen from the operating-cost figures detailed that the low-frequency furnace is the least expensive to operate either as a melter or as a holding unit. The limitation of the low-frequency furnace is its inability to deal satisfactorily with refining problems and the necessity of having to operate with a molten-metal "heel." Starting such a furnace also requires either a starting charge of suitable size or the provision of a certain amount of molten metal.

T.V. Unit for Industry

A new industrial television unit, operating on a closed circuit, has been developed by Pye, Limited, of Cambridge. The camera, generator and power supply components are contained in a single case, weighing only 30 lb. It will operate on normal power supply and requires no additional lighting. If so desired, the pictures can be fed into a commercial set, any number of which can monitor the pictures being relayed. The running costs of the industrial camera on tube life alone have been reduced to a few shillings an hour. The equipment is quite simple to operate, having only three controls and a focus. The monitor may be located up to 1,000 ft. away from the camera.

Fundamentals of Corrosion

A Summer School on "The Fundamentals of Corrosion and its Prevention" will be held in the Metallurgy Department of the Battersea Polytechnic from July 20 to 23, when eight lectures will be given by S. C. Britton, M.A.; T. P. Hoar, M.A., Ph.D., F.I.M., F.R.I.C.; and L. L. Shreir, Ph.D., F.I.M., F.R.I.C. The lectures will include the following: "Electro-Chemical Principles of Corrosion," "Immersed Corrosion," "Dry Corrosion," "Atmospheric Corrosion," "Underground Corrosion," "Inhibitors," "Metal Coatings," and "Non-Metallic Coatings." Further particulars may be obtained from the Department of Metallurgy, Battersea Polytechnic, Battersea Park Road, London, S.W.11.

The Third *Salon de la Chimie et des Matières Plastiques* will be held at the Parc de Expositions, Porte de Versailles, Paris, from December 3 to 12, 1954.

New Catalogues

Dust-removal Plant. In publication DFR 953, Newton Collins, Limited, of Barford Street Works, Birmingham, describe and illustrate by means of simple line drawings foundry plant for the removal of dust and fume arising from pouring, cooling, knock-out, swing-frame grinders, and fettling-shop plant. The problem of swing grinders is tackled quite differently from others. The one described and illustrated relates to the provision of a cubicle just beyond the grinding wheel. The doors of this exhaust cubicle are spring loaded so that the gap is at a minimum no matter what the operating position may be. Moreover, the work stand is of grate-top formation, so that it too is dust exhausting. This pamphlet is written in such a way as it will make an initial appeal to the foundryman. It is available to readers on writing to the Barfield Street Works.

Aluminium Alloy. A neat pamphlet received from High Duty Alloys Limited of Slough details the properties of Hiduminium "100" the sole licence for the manufacture of which has been acquired from the S.A. pour l'Industrie de l'Aluminium. It is a sintered product carrying good properties at elevated temperatures, for tensile strength, and corrosion resistance, making it of interest to chemical engineers. It is amenable to hard anodic surface-treatment which obviously widens its potential use. The brochure contains graphs and tabular matter indicating the mechanical and other characteristics of the alloy. It is available to readers on writing to Slough.

Pressure Fans. In publication 154.B. Standard and Pochin Bros., Limited, of Evington Valley Road, Leicester, detail the performance data and shipping specifications of a wide range of "P.X." fans using three- and single-phase 50 cycle or d.c. motors. It is available to readers on application to Leicester.

Publications Received

Metal Statistics, 1938-1952. Published by Metallgesellschaft, 24, Reuterweg, Frankfort-on-Main.

This book, printed in English, has 238 pages and covers price, production, export and import figures and the like for all important countries for aluminium, lead, copper, zinc, tin, cadmium, nickel, mercury and silver. To those handling these metals it is a unique source of information.

Ijzergieterijen in Amerika. Published by Contactgroep opvoering Productiviteit, 43, Raamweg, 's-Gravenhage, Holland. Price: 8 florins.

This is a report of a visit made by a Netherland's grey ironfounders' team to the United States to study productivity. It was headed by Baron Krayenhoff; and, like the British teams, was composed of both management and workmen. The Report follows the usual lines and is profusely illustrated. There is, however, a section printed in English which sets out a summary of the Report, its conclusions and recommendations. The reviewer found this very interesting, as it discloses not only differences in practices between Holland and America, but also as between the former country and the United Kingdom. For instance a comment is made on the desirability of taking chill tests of the cupola metal—a system much practised in this country. From the Report it would seem that "cash on delivery" is demanded by American foundries from their customers. The reviewer congratulates the team on having produced a splendid report.

I.B.F. Conference Fund, 1954

The list of subscriptions so far received for the 1954 Conference of the Institute of British Foundrymen, for which the Scottish branch are the hosts, is printed below. The conference is to be held from June 22 to 26, with headquarters in Glasgow, and details will shortly be published.

	£	s.	d.
Albert Smith & Company	250	0	0
Institute of British Foundrymen (Scottish branch)	250	0	0
Federated Foundries Limited	250	0	0
Babcock & Wilcox, Limited	200	0	0
G. & J. Weir, Limited (Argus Foundry & Holm Foundry)	200	0	0
Bonnington Castings Limited	105	0	0
Glenfield & Kennedy Limited	105	0	0
North British Steel Foundry Limited	105	0	0
Mr. Daniel Sharpe	105	0	0
Robert Taylor & Company, Limited	105	0	0
Allied Ironfounders, Limited	100	0	0
Atlas Steel Foundry, Limited	100	0	0
William Beardmore & Company, Limited	100	0	0
Carntyne Steel Castings Company, Limited	100	0	0
Carron Company	100	0	0
Clyde Alloy Steel Company, Limited	100	0	0
Cruikshank & Company, Limited	100	0	0
Fullwood Foundry Company, Limited	100	0	0
North British Locomotive Company, Limited	100	0	0
Steel Company of Scotland, Limited	100	0	0
Harland & Wolff, Limited	75	0	0
Lane & Girvan, Limited	52	10	0
Smith & Wellstood, Limited	52	10	0
Mackenzie & Moncur, Limited	50	0	0
Mavor & Coulson, Limited	50	0	0
Renton & Fisher, Limited	50	0	0
Mitchell, Russell & Company, Limited	42	0	0
Aluminium Castings Company, Limited	31	10	0
A. F. Craig & Company, Limited	30	0	0
G. M. Hay & Company, Limited	30	0	0
Mirrlees Watson Company, Limited	30	0	0
Paisley Brass Works Company, Limited & J. R. McKellar (Alloys), Limited	30	0	0
R. Berrie & Company, Limited	26	5	0
Dewrance & Company, Limited	26	5	0
Grahamston Iron Company, Limited	26	5	0
Alley & McLellan, Limited	25	0	0
Barr & Company, Limited	25	0	0
Caledonian Foundry Company, Limited	25	0	0
William Dickie & Sons, Limited	25	0	0
Jones & Campbell, Limited	25	0	0
Lion Foundry Company, Limited	25	0	0
A. McArthur & Son	25	0	0
R. & A. Main, Limited	25	0	0
Miller & Company, Limited	25	0	0
Renfrew Foundries, Limited	25	0	0
Shanks & Company, Limited	25	0	0
Shanks Ironfounders, Limited	25	0	0
Stewarts and Lloyds, Limited	25	0	0
Andrew Strang & Company, Limited	25	0	0
R. B. Tennent, Limited	25	0	0
West Lothian Steel Foundry Company, Limited	25	0	0
Thomas White & Sons, Limited	25	0	0
John Lang & Sons, Limited	21	0	0
Paterson, Hughes Engineering Company, Limited	21	0	0
Blairs, Limited	20	0	0
Henry Brown & Company (Irvine), Limited	20	0	0
Mr. A. Campion	20	0	0
Moses McCulloch & Company	20	0	0
George Paul & Company	20	0	0
Paul & McLachlan, Limited	20	0	0
National Steel Foundry (1914), Limited	15	15	0
Aberdeen Grit Company, Limited	10	10	0
Bathgate Foundry Company, Limited	10	10	0
Forth & Clyde Steel Foundry (1932), Limited	10	10	0
Douglas Fraser & Sons, Limited	10	10	0
Keith Blackman, Limited	10	10	0
Thomas McLaren & Sons, Limited	10	10	0
Mechans, Limited	10	10	0
Foundry & Engineering Products Co. (Glasgow), Limited	10	10	0
Bo'ness Iron Company, Limited	10	0	0
James Howden & Company, Limited	10	0	0
Lawside Engineering & Foundry Company, Limited	10	0	0
William McPhail & Sons, Limited	10	0	0
A. Ballantine & Sons, Limited	7	7	0
Drysdale Bros. (Larbert), Limited	5	10	0
Barr & Stroud, Limited	5	5	0
Brown Brothers & Company, Limited	5	5	0
Carmuirs Iron Company, Limited	5	6	0
Grange Foundry Company, Limited	5	5	0
Gray & Caldwell, Limited	5	5	0

(Continued at foot of col. 2)

Industrial Design in Scotland

It is hoped to bring together at the Scottish Design Congress, which is to be held in Edinburgh on May 26 and 27, leading figures from every sphere throughout Scotland who have the opportunity to influence design in one way or another—manufacturers, wholesalers, retailers, public servants, and local authorities. Although it is to be primarily a Scottish congress, speakers have been drawn from a wide field, and it is hoped to have representatives from organizations particularly interested in industrial design from other parts of the United Kingdom, and also from abroad.

Among those who have agreed to give papers are:—Sir John Maud, Parliamentary Secretary to the Ministry of Fuel and Power; Sir Walter Puckey, president of the Institution of Production Engineers; Mr. T. C. Coughtrie, chairman of the Belmos Company, Limited, colliery and industrial switchgear manufacturers, of Bellshill (Lanarkshire); Sir Colin Anderson, a former president of the Chamber of Shipping of the United Kingdom; Sir Thomas Barlow, a former chairman of the Council of Industrial Design; and Mr. Misha Black, director of the Design Research Unit.

An exhibition illustrating development in design during recent years, and a selection of current products of outstanding design will form a background to the papers and discussions. Speakers will discuss the problems they have encountered in raising design standards in a variety of fields, and will show how they themselves have tackled them and achieved results. Papers will deal with the basic idea of building up and maintaining a progressive design policy at the highest level. The address of the Council of Industrial Design Scottish Committee is 95, Bothwell Street, Glasgow, C.2.

C. & G. Insignia Awards

Mr. S. H. Russell, a past-president of the Institute of British Foundrymen, has been awarded the Insignia of the City and Guilds of London Institute. A similar award, again under the heading "mechanical industries (foundry engineering)," was made to Mr. T. Hurst, of Darlington Forge. From the foundry point of view, it is interesting that so far only three of these awards have been made to candidates who have actually met the conditions and submitted theses on a subject specified by the Institute, and the one gained by Mr. Hurst is of that character.

(Continued from col. 1)

Hardie & Gordon	5	5	0
John McFarlane & Company, Limited	5	5	0
Merchiston Foundry, Limited	5	5	0
D. & J. Tullis, Limited	5	5	0
Urquhart, Lindsay & Robertson Orchar, Limited	5	5	0
John Broadfoot & Sons, Limited	5	0	0
Dorrator Iron Company, Limited	5	0	0
Shaw & McInnes, Limited	5	0	0
John M. Rodger & Son, Limited	4	4	0
Barry, Henry & Cook, Limited	3	3	0
John Leitch & Company, Limited	3	3	0
Sharp & Company (Lennox Foundry)	3	3	0
Steven & Struthers, Limited	3	3	0
Anderson, Grice Company, Limited	2	2	0
Ardeer Foundry Company, Limited	2	2	0
Bertrams, Limited	2	2	0
Cockburns, Limited	2	2	0
Alexander Couper & Company, Limited	2	2	0
Robert Currie & Company, Limited	2	2	0
Russell & Company	2	2	0
Shaw Glasgow, Limited	2	2	0
Total	£4,117	19	0

Parliamentary

Problem of Air Pollution

Government plans for a country-wide attack on the problem of air pollution were announced by MR. ERNEST MARPLES, Parliamentary Secretary to the Ministry of Housing and Local Government, in the House of Commons on March 10. He was speaking during the Second Reading of the City of London (Various Powers) Bill.

Mr. Marples said that the policy would be a steady extension of smokeless zones, which were possible now because of the larger quantities of the types of fuel needed, and more steel for making the appliances to burn it. The Government was determined to conquer the evil of air pollution generally. It was estimated, he said, that there were 12,000,000 houses with open fires, which was too many if there were to be smokeless cities. The Government wished to instal modern grates in the old houses and to ensure a steady supply of smokeless fuel.

The Government proposed to persuade as many local authorities as possible to display for several months two or three improvements and conversions, including fuel-saving appliances, with details of their weekly running expenses.

Electric Cable Manufacture

"Very soon," was the reply given by MR. DUNCAN SANDYS, Minister of Supply, when MR. SWINGLER asked him when he expected to be in a position to state the policy of the Government on the recommendations of the Monopolies Commission with regard to the manufacture and supply of electric wires and cables.

Urged to say whether the Government was in agreement with the recommendations that exclusive dealing provisions with wholesalers in the cablemaking industry should be stopped, the Minister replied that it would be most unsatisfactory for him to announce piecemeal decisions on the recommendations.

MR. SWINGLER suggested that the reply was similar to one given in November last year and in January this year. Independent cablemakers, suffering from monopolistic restrictive practices, were becoming worried.

MR. SANDYS said that much work was involved in following up these reports of the commission before a decision on action was taken. The Government had to be satisfied that it was in agreement with the recommendations, which were often very far-reaching. That entailed detailed investigation of the industry.

Industrial Fuel Efficiency

The Minister of Fuel and Power was asked by MR. NABARRO what steps he was taking to amplify the industrial fuel efficiency loans scheme, and whether he would make a statement.

MR. JOYNSON-HICKS, the Parliamentary Secretary, who replied, said that loans could now be considered for proposals which related to non-industrial as well as to industrial schemes, provided that they were calculated to save substantial amounts of fuel and were not primarily required for replacement of equipment necessitated by wear and tear.

MR. NABARRO also asked the Minister whether he had now completed his survey of industrial steam usage with a view to promoting further employment of back-pressure turbines in all suitable cases, and in view of the significant coal economies that might thus be achieved.

MR. JOYNSON-HICKS intimated that the survey was now nearly completed and that the results would be published in a few months' time in the Ministry's Statistical Digest.

Large Overseas Orders Secured

Draft contracts with Russia amounting to £3,500,000 and covering the supply of Diesel generating sets, turbines, transformers, switchgear, and spare parts have been initialled by Mr. Sydney A. Lane, a director of the Brush Group, who was a member of the recent business mission to Moscow.

Announcing this, the Brush Group states: "This is a valuable addition to the orders which have been obtained from the U.S.S.R. by the companies of the group over a period of some years and, subject always to the grant of the appropriate export licences, brings the total firm business transacted by Mr. Lane in his two visits to Russia during recent months to £5,000,000."

An order for four 138,000-kw. waterwheel generators has been received by Metropolitan-Vickers Electrical Export Company, Limited, from the Quebec Hydro-Electric Commission. The contract is worth nearly $3,000,000 (approximately £1,100,000). The generators, which are believed to be the most powerful of their kind in the world, will be manufactured at the Trafford Park works of the company, and the first two are to be commissioned by the end of 1956.

A third contract, won in the face of keen American competition, involves the design, manufacture, installation, and putting-to-work of a large plant to make high-grade town gas from heavy petroleum oil, and including the recovery of by-products. It was secured by the Australian subsidiary of the Power-Gas Corporation, Limited, Stockton-on-Tees, for the construction of chemical plant for Petroleum & Chemical Corporation (Australia), Limited, Sydney, and is worth about £1,000,000. Although the technical planning and plant design will be done at Stockton, much of the bulky, fabricated-steel equipment will be manufactured in Australia.

C.U.C. Luncheon

Speaking at the annual luncheon of the Coal Utilisation Council (North Western Regional Committee) in Liverpool on March 10, Mr. H. V. Shelton, chairman of the British Ironfounders' Association, referring to domestic solid-fuel-burning appliances, said that the manufacturers could with some pride, claim that, as a result of research and development work, considerable progress had been made, particularly during the post-war years. Both as regards design and efficiency of appliances, as well as the methods of production, methods had been adopted which would enable the industry to cope with any foreseeable increase in the present demand. The new "inset" fires, especially those which would burn all night, were extremely popular with the public and these types had been installed in more than five million homes since the war. However, there were still, he said, about nine million homes in Britain in which coal was still used more wastefully than it need be, and in which the standards of heat comfort were much lower than they ought to be. This was because old-fashioned grates and ranges were still being used. The amenities and standards of comfort of these houses could be greatly improved by the installation of suitable modern domestic solid-fuel-burning appliances.

THE WEST BROMWICH HEALTH EXECUTIVE COUNCIL on March 12 decided to make a second approach to the Birmingham Regional Hospital Board urging it to make available a mobile unit to take large-size X-ray films of all foundry workers in West Bromwich, in a general survey to help combat industrial disease.

Safety Conference Proceedings*

Discussion Group Reports and Employer's Liability Insurance

(*Continued from page* 273)

Discussion Groups

On the second day of the C.F.A. Conference on Safety in the Foundry, the early evening's programme involved the delegates being divided into groups for "round-table" discussions of a number of problems, the leader of each group subsequently reporting to the re-assembled conference. In this way three main groups were arranged:—(1) "Safety Organization—What can the Small Foundry do?" (comprised of two sections); (2) "Protective Equipment—How to make Men use It" (three sections); and (3) "Control of Foundry Atmospheres" (two sections). Each group was provided with a number of questions for which answers were requested and two hours was the period allowed. On re-assembly for reporting the conclusions, all the group chairmen said the time allowed had been found insufficient; and that this item of the conference was felt to be of such worth as to warrant an extension of the idea at future gatherings.

Generally, the answers supplied by the groups (revealed on re-assembly on the Wednesday morning) were substantially as follow:—

Group (1). *Measures for the small foundry* (*Mr. A. Kirkham reporting*).—First, the definition of "small" foundry was taken as one having fewer than 100 employees. The group considered that for foundries of this size:—(*a*) Safety committees were impracticable; (*b*) systematic safety training was better formulated as persistent inculcation of safety consciousness, following upon proper job introduction for new employees; (*c*) the proper person to handle the safety matters was a managing director or other delegated executive, but certainly not a foreman; (*d*) the sharing of safety officers between local founders was not feasible; (*e*) safety precepts for apprentices should include: no "skylarking," orderliness, care of plant and equipment, use of protective devices, and avoidance of risk; (*f*) for lighting, the recommended intensities should be strictly adhered to and coloured walls were an aid to good-housekeeping, as were clean windows and colour marking of electric, air, water and gas service pipes; (*g*) prior medical examination of recruits was desirable, but perhaps not enforceable; (*h*) safety propaganda should *not* be disseminated in pay packets; (*i*) safety booklets would be useful for issuing to employees; and (*j*) when installing new machinery in small foundries, particular regard should be paid to providing adequate space for safe operation; guards should be provided by the makers; wiring and other services should be arranged for permanency; regular maintenance should be envisaged and trailing high-voltage cables avoided.

Group (2). *Making personnel use protective devices* (*Mr. F. A. W. Livermore reporting*).—Some of the opinions of this group included (*a*) the use of a measure of compulsion regarding wearing of appliances—backed by trade union co-operation; (*b*) it should be incumbent on the foundry owner to decide whether safety equipment over and above that required under statutory regulations should be provided free of charge, but it was thought free provision of safety boots was open to abuse; (*c*) statistics were ineffective as accident deterrents and posters had but a limited "shock" effect; (*d*) it was essential to instil confidence in the value of wearing the equipment provided; (*e*) persistent refusal to make use of protective devices should, at least in theory, result in dismissal, for—legally speaking—a firm was condoning an offence if it permitted a man to work without the protective devices required under the Regulations; and (*f*) any accident-reduction propaganda should be easily understandable by the lowest grade of employees.

Group (3). *Control of foundry atmospheres* (*Mr. W. H. White reporting*).—Here the discussion seemed to have followed the lines of detailed consideration of Dr. Angus's paper. "Jack-roof" or replacement-air types of general ventilation were favoured, based on control of air inlets. For heating, radiant panels were pronounced best, with slow-combustion stoves second. Wetting agents were said to be helpful, but not to represent a complete solution of sand dust problems. Knock-outs should be totally enclosed where feasible, or positive air "curtains" should supplement the limited radius of effectiveness of down-draught or side extraction. Employees generally could help in dust control by damping-down sand as soon as possible after knocking-out and preventing accumulations of dust and waste sand. The use of vacuum cleaners was approved, but for fume removal, only "good general ventilation" could be propounded as a mitigatory procedure.

On the subject of compulsion for wearing protective devices, the Chief Inspector of Factories said that his Department would co-operate with founders in securing proper observance of the "must" in the Regulations and, in a last resort, would prosecute offenders. Some onus, he said, was placed on manufacturers of foundry machinery to provide guards to comply with Factory Act requirements—particularly for gearing—but, if specific complaints were received of dangerous features on equipment not being properly guarded, then the Factory Department would take up these matters with the manufacturers concerned. Several speakers at the closure of this discussion reported favourably on the merits of rubber, self-closing

*Report of a conference on "Safety in the Foundry" organized by the Council of Ironfoundry Associations.

doors they had installed between one department and another, through which trucks could be driven without stopping, a Perspex window affording evidence of clear passageway.

Manual Lifting and Handling

Late on Tuesday evening, some light relief in an otherwise dour programme was afforded the delegates in a discourse and demonstration by Mr. G. Hickling, of the Central Council of Physical Recreation, on "Manual Lifting and Handling." This was a very worthwhile item, and the humour with which the points were made proved no distraction from the merits of the methods described. These were based on safe lifting and motion techniques and illustrated by a film strip entitled "Handling Boxes." Correctness of stance, use of leg muscles instead of those of the back and proper sitting, walking, shovelling, gripping, pushing, and wheeling positions were demonstrated, all directly applicable to foundry operations. The use of body weight in lifting and handling so as to economize effort was well brought out, as well as correct use of leg muscles when shovelling and the most effective way of delivering sledge-hammer blows, say, for pig-iron breaking. It was stated to be axiomatic that no damage to muscular systems could be done by trying to lift too-heavy weights, provided the correct stance were adopted; in contradistinction, rupture and hernia were described as usually resulting from cumulative strain brought about by repeated use of improper lifting or carrying postures, sometimes for quite small weights.

Employers' Liability Insurance

The final Paper of the conference, and one which several delegates came specially to hear, concerned "Accident Prevention and Employers' Liability Insurance," and was given by Mr. J. Anderson (Midland Employers' Mutual Insurance Company). Mainly, the paper dealt with the possibility of Common Law claims arising from industrial accidents, as this is the sphere in which an employer is most vulnerable, since the ending of the old Workman's Compensation Act. Under Common Law, safe working conditions are required irrespective of the stipulations of the Factory Acts.

The Author quoted the relative sections under which claims could be brought by workmen against employers, illustrating his points by case-histories. Quite early on, he made it clear that it was very expensive for an insurance company to contest a claim for damages in the Courts, especially as decisions could switch about and appeals be carried to the Lords. Under these circumstances, it was often true that a settlement out of Court was, financially speaking, much better than a moral victory in Court. Common Law required a place of working to be safe, that is, claims for damages due to accidents arising from unfenced holes, defective stairways or floors, etc., would normally succeed, unless the defect was latent, and the employer could not have guarded against it.

Machinery and plant which had to be "safe," virtually was defined as everything in the works, and a point made here was that a part-disabled man should perhaps be specially guarded. A case was cited of a man already blind in one eye securing heavy damages because of loss of the other in a "hammer-and-chisel" accident. There, it was contended by the Judge that, although goggles would not normally be used for the man's work—he was a garage mechanic—they should have been on that occasion because there was a special hazard to a man already blind in one eye. It was not sufficient for protective equipment to be available; the men must be told to wear it. To provide evidence that the man had been so instructed was a good plan. In law, notices and injunctions to "read the factory regulations" were not enough.

In some law cases it had been ruled that the extreme youth of a litigant excluded the admittance of a plea of contributory negligence; for example, following an unusual type of accident a claim was entered against an employer for failing to provide a safe system of working. The case concerned a man 21 years old who was paralysed after a fall from the top of a double-deck bus which he was dismantling. It was held that the employer was negligent in failing to instruct the man as to the proper way to go about the job, because a person of that age could not be expected to think of the risks without a clear warning; an award of £8,000 was made. Since July, 1948, Mr. Anderson said, employers had been liable under Common Law for acts committed by their employees, *e.g.*, drivers of trucks.

Industrial Diseases

Industrial diseases, Mr. Anderson went on to say, were quite a fruitful field for Common Law claims, and quoted the case which succeeded of a lathe operator who died of pneumoconiosis because it was held he had worked close to a dry, tool-grinding machine, which was not fitted with an exhaust. Then, too, were cited the recent foundry cases in the Midlands of alleged pneumoconiosis, which a daily paper had headlined as "Industrial Murder." Dermatitis, also, was a never-absent hazard and hand cleaning with solvents such as oil or petrol and cotton waste should be avoided.

Failures to comply with the Factories Acts as regards safety precautions could also be subjects for Common Law claims, Mr. Anderson said. He instanced moulding-machine squeeze-heads as a potential hazard which was rarely guarded against. Normal fencing of these was impracticable, but he thought control levers or push-buttons should be so positioned that their operation meant the man's hands would be out of danger. Also quoted was the case of the man who fell in an unguarded sand mill; a strong wire-mesh guard was quite a practical proposition on this type of plant. One case where the employer was absolved from responsibility by the Courts concerned an incident where lifting tackle failed; it was proved that proper tackle had been provided, but the employee had used makeshift apparatus.

The Author said he could give no guide to the amounts of compensation awarded; all depended on the circumstances of the case and the feelings of the authorities dealing with it. A workman could claim under Common Law, and at the same time secure compensation for an injury under the Industrial Injuries Act, though in the case of an award a part adjustment had to be made.

Assistance Offered

Voluntary safety organizations within a firm were favoured by Mr. Anderson's firm, and they themselves had set up an accident-prevention department staffed by a cadre of qualified engineers. These would visit a manufacturer's premises and advise on safety measures. Experience had proved (*a*) that the accident record of firms using this service had been bettered, but (*b*) nearly every case examined had revealed some fault. Safety precautions were, he thought, properly a joint responsibility of both managements and employees.

Following the Paper, questions were raised about the legal interpretation of such words as "provide," "safe access," "reasonable" and "adequate," but Mr. Anderson held that these were just the words in factory legislation on which opinion as to their meaning was only obtained after costly litigation. He added that, to-day, any accident, however caused, has a nuisance value, and capital was being made out of that fact by unscrupulous persons and organizations, with the result that the employer or the insurance company was a financial loser in nearly every case.

Asked about the possibility of a workman wilfully circumventing safety precautions, Mr. Anderson said that a prosecution could be instituted in such cases and a fine of up to £20 levied. Notices and even signed statements absolving an employer or occupier from liability for accidents arising on his works were not legally binding. Even the signing by employees of a receipt for safety equipment, though desirable, was not "100 per cent. watertight," as an employer must also provide adequate supervision to see the equipment was used. Another question concerned accidents to contractor's personnel in foundries; here Mr. Anderson said that there were several interesting cases recorded but, generally, the contractor was responsible for his own men, and the occupier also for his, even though the contractor might be at fault.

Conclusion and Prologue

Following this discussion, the conference proceedings terminated and Mr. Gresty proposed a vote of thanks to all the speakers, the organizers and the various principals who had made their contributions possible. This was warmly accorded, as was appreciation to the Chairman for his share of the work.

In his recorded remarks at the opening of the conference, Mr. Harold Watkinson, Parliamentary Secretary to the Ministry of Labour, had stated that in 1951 there were over 11,000 accidents in iron foundries, 22 of which were fatal. He said these figures represented both a measure of human suffering which we cannot accept complacently and a loss in production which we can ill afford. He was specially glad that the conference would learn from the experience of others, notably the steel and rubber industries. This interchange of ideas and experience between firms and industries about accident prevention was something it was important to develop. He wished to see the principle underlying it operating in many other aspects of industrial life.

Following the trend of these remarks, the worth of the whole conference which has been here reported might be assessed in the future trend of accident statistics for the foundry industry. A good beginning has undoubtedly been made, when 120 serious-minded executives can get together for two days to thrash out pertinent matters in conference, and the organizers can congratulate themselves. If but one life has been saved or mutilation of one body prevented as a result of their labours, then, indeed, these efforts will be paying good dividends.

Need for Freer Trade

While this country's economic position still looked precarious in the immediate future, Sir Harry Pilkington, chairman of the Federation of British Industries, thought, when he addressed a meeting of the Federation's North-Western Region early this month, that the greater flexibility and freedom in the economy compared with a year ago gave cause for hope in that industry's affairs were so much more in its own hands than previously. Apart from the need for enterprise, increased exports, more mechanization, and less waste, we required to make ourselves competitive, to expand world trade, and to have access to all the markets of the world.

It was very important, Sir Harry said, that since we, of all countries, were dependent on the growth of international trade and the freeing of its channels, we should take risks, if need be, to hasten the end of these payment obstacles to trade and to put our own customer countries in a position to do the same.

Sir Harry did not advocate the abolition of tariffs on manufactured imports nor a reduction in Imperial Preference, but he did not think that this form of protection ought ever to be bolstered up by the retention of import licensing or quotas one day longer than they might be necessary.

Trade between Japan and the sterling area was going to be approximately in balance. Sir Harry warned, however, that Japan must abide by the ordinary rules of international trade and must trade fairly. This was not just a question of price—though prices entered into it. It was very much a question of the copying of designs and of trade marks and the pirating of "know how" and patents, of imitation generally.

Human Factor in Productivity

Mr. Harold Watkinson, Parliamentary Secretary to the Ministry of Labour and National Service, opened the three-day conference on "The Human Factor in Productivity," which began at the Palace Hotel, Buxton, last Thursday. Nearly 200 representatives of firms around Nottingham, Leicester, Lincoln and Derby, and in the eastern parts of Cheshire and the West Riding of Yorkshire, attended the Conference, which was especially for directors, general managers and works managers in the areas quoted. The meeting was arranged under the joint auspices of the British Institute of Management, the Institute of Personnel Management and the Personnel Management Advisory Service of the Ministry of Labour and National Service.

Notes from the Branches

Newcastle-upon-Tyne

At a recent meeting of the Newcastle-upon-Tyne branch of the Institute of British Foundrymen, Mr. B. Levy, president of the London branch, presented a paper entitled "Does the Patternshop give the Foundry What it Wants?" Although Prof. A. Preece, president of the branch, attended the Council meeting in advance of the lecture, he was indisposed and was persuaded to return home, Mr. G. Elston, a former president, taking the chair.

In introducing Mr. Levy to the meeting, which was attended by between 60 and 70 members and visitors, the chairman mentioned that, although patternmaking was a very important part of foundrywork, the subject was presented for discussion at these meetings only rarely and, in view of the contentious nature of the title, he expected a lively discussion.

Mr. Levy first tabulated the many criticisms levelled at patternmakers by foundrymen, explaining each in turn, and then discussed the many factors that must be considered before the construction of a given pattern can be commenced. The need for co-operation between the drawing office, the foundry and the patternshop was emphasized, but the quality of a pattern, from the foundry point of view, must depend upon cost, and this was governed to a large extent by the number of times the pattern is required to be used and the degree of accuracy of the finished castings to be produced from it. Given a fairer allocation in the cost accounting of a particular job so that adequate pattern equipment could be supplied, there would be less difficulty in supplying the foundry with what it wanted. Many interesting examples of pattern equipment, in both wood and metal, were illustrated on the screen.

Mr. Elston thanked the lecturer for the manner in which he had presented the subject and, in opening the meeting for discussion, suggested that what the foundry needed, rather than wanted, would be more appropriate. As the chairman had anticipated, a very lively discussion resulted; many long-standing grievances of the foundry were raised, but it seemed that the question of cost played a vital part in giving the foundry what it wanted. Mr. Levy suggested, however, that if the foundryman could visualize the finished casting in the initial stages, co-operation between the departments would be facilitated. The meeting concluded with a vote of thanks to Mr. Levy for his excellent paper and for making such a long journey to present it in person.

Members of the branch held their annual dinner on March 5 at the Crown Hotel, and it proved very successful, the function being entirely informal. About 60 members and their ladies attended and, after the loyal toast, the branch-president, Prof. A. Preece, whom everyone congratulated on his recovery from a recent indisposition, proposed the health of the ladies. An excellent entertainment was provided, the star turn being Patterson, a mystery man. The arrangements for this function were largely in the hands of the hon. secretary, Mr. Robinson, who well merited the congratulations he received.

Coventry Students' Section

At the February meeting of the Coventry Students' section of the Birmingham branch, members heard a Paper by Mr. P. G. Pentz, B.SC., on "Recent Developments with Synthetic Resins in the Foundry Industry."*

* Shortly to be printed—EDITOR.

After reviewing certain difficulties and limitations in the normal shell-moulding process, Mr. Pentz dealt with a modification of the process which, it was claimed, would supersede the present methods and lead to much wider use of shell moulding. This new development consisted in coating individual grains of sand with a film of resin, thus eliminating certain defects previously caused by segregation and separation of the conventional powdered resin from the dry sand. The pre-coated sand, it was said, eliminated health hazards, increased resin efficiency, reduced mould cost and made possible the blowing of shell cores.

Other recent advances in the use of resins in the foundry industry referred to in this Paper included the use of liquid phenolic resin for the wet-shell or "D" process; a method of making shell moulds (suitable even for heavy steel castings) by the use of wooden patterns and without heat; and the use of the newly-developed furane resins both for coating moulds and for preparing cheap sand core-carriers of high durability.

East Midlands—Northampton Group

On February 26, the fifth meeting took place in Wellingborough of the Northampton and district group of the East Midlands branch, at which Mr. B. N. S. Perry presented his Paper entitled "Some Modern Methods of Patternmaking with Reference to American Practice and in Particular Pressure-cast Aluminium Patternplates," which was very well received.

This meeting was held to take the place of an established section's annual general meeting, as it was the last of the season except for a works visit. At the meeting it was agreed that immediate approach would not be made for full section status, but that, in spite of the good attendance and healthy augury for the future, a further year's work would be undertaken on the same lines as 1953-54, after which application for full section status would be made, if conditions and enthusiasm warranted it. The works visit will take place on Saturday, March 20, when the group will visit the shops of G. Perry & Sons, Limited, Leicester, to have an opportunity of examining the equipment and machines referred to in Mr. Perry's lecture.

Sheffield Firm's Declining Order Book

Profits of Thos. Firth & John Brown, Limited, may be significantly lower in the current year if the present trend in available business continues, states Dr. Charles Sykes, managing director, in a statement to shareholders reviewing the financial year ended October 3, 1953. He says that the aggregate value of incoming orders has been substantially less than the aggregate value of deliveries during 1953 for the main sections of production.

In the case of rolled products, a substantial reduction in demand has resulted from modifications in the rearmament programme and also from the running down of customers' stocks. Deliveries have now caught up with the backlog of orders, with the result that some part-time operation of the rolling mills has had to be introduced. For heavy forgings, hardened steel rolls, castings, tyres, and engineering products, the forward order-book is satisfactory, adds Dr. Sykes.

For the first time for some years the value of stocks and work in progress has decreased rather than increased, states Dr. Sykes. During the present year the fall has amounted to approximately £500,000. Part of this—some £200,000—is associated with the fall in value of high-speed steel stocks resulting from reductions in the price of tungsten throughout the year.

Estimation and Influence of the Gaseous Elements in Cast Iron*

By L. W. L. Smith, B.Sc., B. B. Bach, B.Sc., A.R.I.C., and J. V. Dawson

(*Continued from page* 280)

The neutralizing effect of aluminium (Melt 13, Table XIII) on the carbide stabilizing effect of nitrogen during the second stage anneal was shown by the heat treatment of a similar series to which a 0.1 per cent. aluminium addition had been made prior to nitrogen treatment. Complete neutralization of the effects of nitrogen up to 240 p.p.m. by this addition was shown by the structures and B.H.N. determinations (Fig. 22) on the samples after an anneal for varying periods.

Bleeding from the feeder heads which had occurred during the preparation of the previous melt was also eliminated by the addition of the aluminium although the same level of nitrogen had been reached.

Other Annealing Effects

The influence of nitrogen on both stages of an anneal has also been investigated by means of the dilatometer tests already referred to in a previous section. When the samples were heated to 950 deg. C. during 17 hours and maintained at that temperature a malleable iron containing 70 p.p.m. of nitrogen required about 12 hours for the completion of first stage graphitization. This time progressively increased with increasing nitrogen content of the sample, until at 185 p.p.m. nitrogen, about 25 hours were required. The corresponding times for the second stage graphitization at 710 deg. C., after cooling to this temperature at about 14 deg. C. per hour, were approximately 27 and 85 hours respectively. The expansion-time curves obtained on this series (Melt 14, Table XIV) are shown in Fig. 23, and a plot showing the increased times of both stages of anneal required with increasing nitrogen content, in Fig. 29.

Tensile bars of this same series of materials were also annealed commercially. Even at 70 p.p.m. nitrogen the annealed material was not entirely free of pearlite. A progressive coarsening of the nodules formed as the nitrogen content increased was found. Figs. 25 and 26 show the structures of two of these bars, 14(*a*) and 14(*d*). The influence of the nitrogen on the annealed material was shown in the mechanical tests (Table XIV).

A similar series (Melt 15, Table XIV) containing an initial addition of 0.01 per cent. aluminium gave a ferritic structure at 70 p.p.m. nitrogen with the same annealing cycle and more numerous small nodules had been formed. Increase in the nitrogen content through the series resulted in the formation of an increasing pearlitic rim until at 185 p.p.m. nitrogen a considerable amount of pearlite remained throughout the bar and a coarsening of the nodules was again observed. Structures of bars 15(*a*) and 15(*c*) are shown in Figs. 27 and 28. Dilatometer curves showing the neutralizing effect of 0.01 per cent. aluminium at 70 p.p.m. and 185 p.p.m. nitrogen are shown in Fig. 24.

When an addition of 0.06 per cent. aluminium was made initially (Melt 16, Table XIV) no pearlite remained after the anneal even at the edges up to 120 p.p.m. nitrogen but a pearlitic rim became evident at 160 p.p.m. The temper carbon nodules up to this level were again fine and numerous. The structure of 16(*d*) is shown in Fig. 30. Dilatometer tests on these materials with the 0.06 per cent. addition showed that even samples containing 240 p.p.m. nitrogen with 0.02 per cent aluminium

*Substantially as delivered to the Birmingham branch of the Institute of British Foundrymen. The Authors are on the staff of the British Cast Iron Research Association.

TABLE XIV.—*Mechanical Properties of Melts* 14, 15 *and* 16.

Melt No.	N, p.p.m.	T.C., per cent.	Si, per cent.	Mn, per cent.	S, per cent.	P, per cent.	Al, per cent.	Yield stress (tons/sq. in.)	Ultimate tensile stress (tons/sq. in.).	Elongation, per cent.
14 (*a*)	70	3.14	0.52	0.32	0.107	0.059	N.D.	12.6	22.6	14
14 (*b*)	70	3.14	0.52	0.32	0.099	0.058	<0.01	12.1	20.8	15
14 (*c*)	125	3.17	0.52	0.32	0.106	0.059	N.D.	14.4	24.6	8
14 (*d*)	185	3.17	0.52	0.32	0.103	0.059	N.D.	13.5	25.3	10
14 (*e*)	260	3.18	0.50	0.32	0.099	0.061	N.D.	14.1	25.0	9
14 (*f*)	285	3.19	0.50	0.33	0.096	0.062	N.D.	14.1	24.0	9
15 (*a*)	75	3.00	0.53	0.38	0.111	0.055	N.D.	10.8	21.8	18
15 (*b*)	140	2.99	0.53	0.37	0.115	0.056	N.D.	11.2	22.4	18
15 (*c*)	185	2.98	0.53	0.37	0.109	0.056	N.D.	12.7	25.8	15
15 (*d*)	275	2.98	0.53	0.37	0.103	0.057	N.D.	12.1	25.7	14
15 (*e*)	280	3.00	0.52	0.37	0.103	0.057	N.D.	13.6	26.4	11
16 (*a*)	85	2.93	0.48	0.29	0.105	0.059	N.D.	12.2	23.6	15
16 (*b*)	85	2.97	0.48	0.30	0.109	0.054	0.06	11.1	19.1	16
16 (*c*)	125	2.95	0.50	0.29	0.106	0.058	0.06	11.1	19.5	15
16 (*d*)	160	3.02	0.50	0.29	0.106	0.056	0.06	11.8	19.2	13
16 (*e*)	235	2.95	0.48	0.29	0.100	0.056	0.02	13.5	24.4	13
16 (*f*)	240	2.92	0.48	2.29	0.100	0.060	0.02	13.7	24.7	11

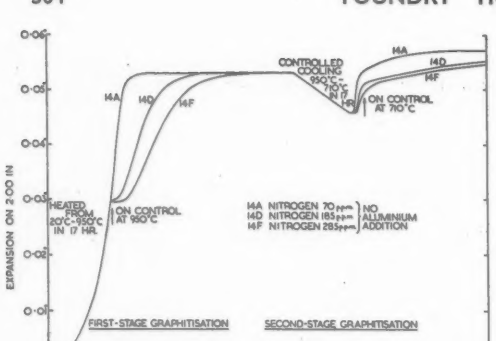


FIG. 23.—*Dilatometer curves for malleable iron (melt* 14).

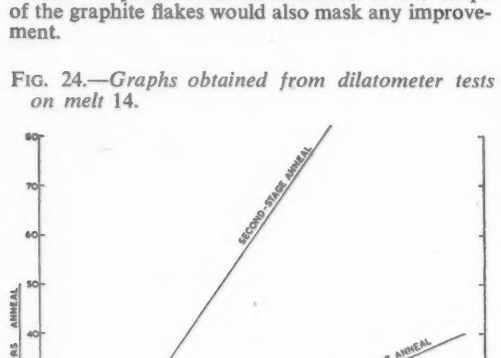
present annealed as rapidly as untreated material in the absence of aluminium.

The position of boron in occupying a similar role to aluminium in relation to nitrogen is not clear at present but preliminary results show that some neutralizing effect is present.

Modification of Graphite

In addition to the carbide stabilizing effect of nitrogen a modification in the shape of the graphite flakes was observed. In the presence of nitrogen the flakes become shorter, thicker and had more rounded ends. Figs. 31 and 32 illustrate this change in samples 12(*b*) and 12(*d*). An improvement in the strength of the material would be expected from such a change but this improvement would probably be outweighed by the carbide stabilizing influence of the nitrogen. The porous nature of castings produced with a sufficiently high nitrogen content to produce the modification in the shape of the graphite flakes would also mask any improvement.

FIG. 24.—*Graphs obtained from dilatometer tests on melt* 14.



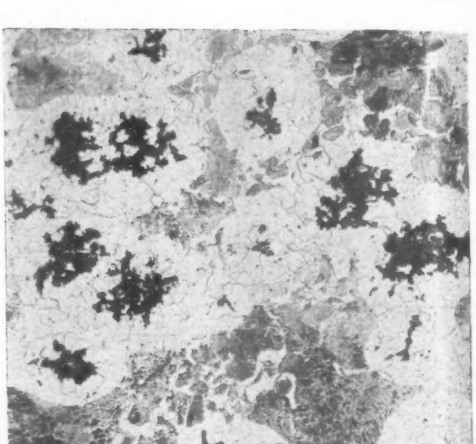
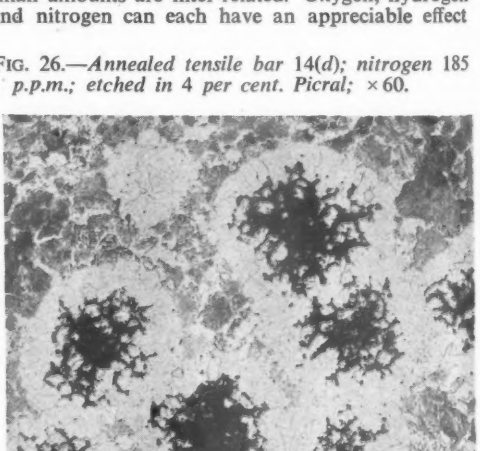


FIG. 25.—*Annealed tensile bar* 14(*a*)*; nitrogen* 70 *p.p.m.; etched in* 4 *per cent. Picral;* ×60.

Concluding Remarks

The effects of the gaseous elements on cast iron reported in much of the published work are often based by necessity on circumstantial evidence, for an indication of the change in one of these elements. Here difficulties must arise in correlating the results obtained in different circumstances since these elements and others also present in small amounts are inter-related. Oxygen, hydrogen and nitrogen can each have an appreciable effect

FIG. 26.—*Annealed tensile bar* 14(*d*)*; nitrogen* 185 *p.p.m.; etched in* 4 *per cent. Picral;* ×60.



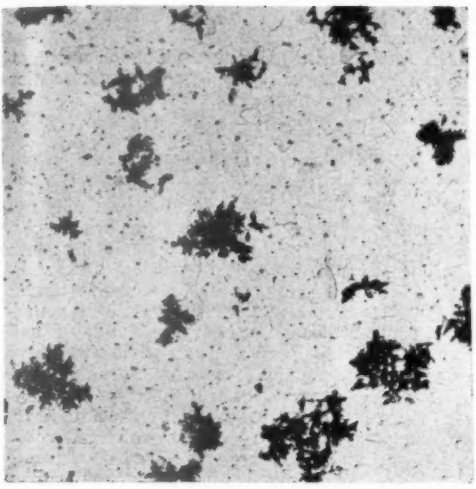


FIG. 27.—*Annealed tensile bar* 15(*a*); *nitrogen* 75 *p.p.m.; aluminium added* 0.01 *per cent.; etched in* 4 *per cent. Picral;* × 60.

in shaping the property of the cast iron although the effect may not be due directly to the presence of the element.

It has been shown in the work at the B.C.I.R.A. that at least some deoxidizing elements react with nitrogen present and so modify the structure of the iron. Relating the effects due to oxygen in terms of modification of the properties due to the addition of deoxidizers becomes more difficult. Both

FIG. 28.—*Annealed tensile bar* 15(*c*); *nitrogen* 185 *p.p.m.; aluminium added* 0.01 *per cent.; etched in* 4 *per cent. Picral;* × 60.

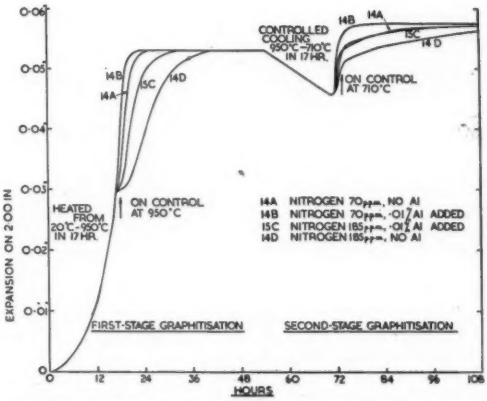
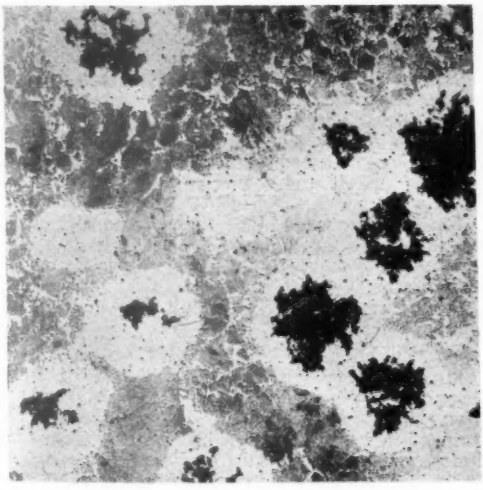


FIG. 29.—*Dilatometer curves for malleable irons, melts* 14 *and* 15.

the oxygen and nitrogen contents of the iron will be of importance in considering the effects of the addition of the deoxidizers.

The addition of a small amount of aluminium to a melt would result in its combination with the available oxygen leaving perhaps a small residual amount of aluminium. The nitrogen may now combine with some of this residual aluminium and result in a reduction of both the available nitrogen and aluminium. If it be assumed that the oxygen is without effect on the iron, the modifications in the properties could be the result of the removal of the effects of nitrogen, the presence of the residual amount of aluminium or an inoculating effect due to the presence of the alumina or aluminium

FIG. 30.—*Annealed tensile bar* 16(*d*); *nitrogen* 160 *p.p.m.; aluminium added* 0.06 *per cent.; etched in* 4 *per cent. Picral;* × 60.



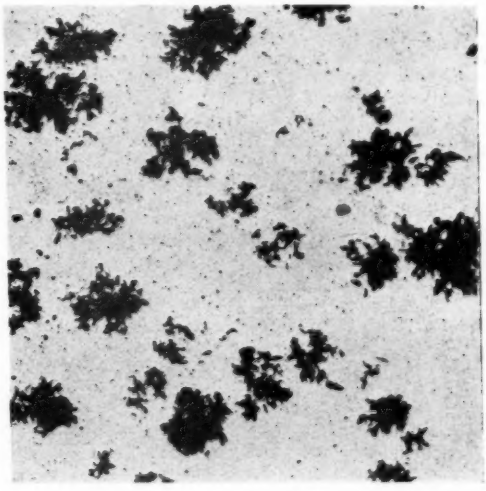
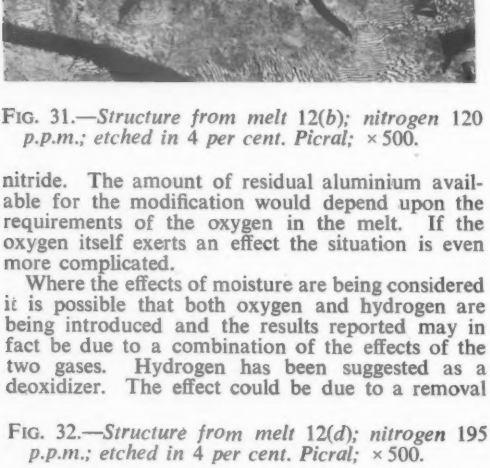


FIG. 31.—*Structure from melt* 12(*b*); *nitrogen* 120 *p.p.m.; etched in* 4 *per cent. Picral;* × 500.

nitride. The amount of residual aluminium available for the modification would depend upon the requirements of the oxygen in the melt. If the oxygen itself exerts an effect the situation is even more complicated.

Where the effects of moisture are being considered it is possible that both oxygen and hydrogen are being introduced and the results reported may in fact be due to a combination of the effects of the two gases. Hydrogen has been suggested as a deoxidizer. The effect could be due to a removal of the oxygen or to the introduction of the hydrogen.

FIG. 32.—*Structure from melt* 12(*d*); *nitrogen* 195 *p.p.m.; etched in* 4 *per cent. Picral;* × 500.



The Authors wish to thank the Council and director of the British Cast Iron Research Association for permission to publish this Paper.

DISCUSSION

Vote of Thanks

MR. WRIGHT, when proposing a vote of thanks to the Authors, said that although some difficulty had been experienced in securing for the branch programme a Paper of more academic interest than usual, he was sure that having listened to it, everyone had enjoyed it and much had been learned. It was due to people like Mr. Smith and his associates at the B.C.I.R.A. that many present-day practical methods were instituted, and what was theory to-day would be practice to-morrow. For this reason, the occasional lecture of an academic type was beneficial and especially so when such an abstruse subject was presented in a manner which all could understand, as had been done. That the Authors had this matter very much at heart was obvious from the Paper, slides and graphs which they had presented. He hoped the work would continue.

DR. KONDIC said members had had an opportunity of witnessing the remarkable progress which was being made. Even so he thought only the very surface of the problem had been scratched, and much more had to be done. Such work required more and more backing, and although the practical side could not always be seen immediately, there was no doubt of the very valuable applications which would follow. He wished to add his thanks to those of Mr. Wright and to heartily second the vote of thanks to Mr. Smith.

Correlation with Chill

MR. WRIGHT referred to the addition of nitrogen, etc., in trying to correlate this to an increase in chill depth. He said they had found on one occasion the increase in chill as expected, but concurrent with this was a decrease in silicon. He asked whether there was any decrease in the silicon to account for the chill test and whether this possibility had been investigated.

MR. SMITH said that certainly if there was a decrease it was very slight and insufficient to effect the depth of chill.

MR. FRANCIS asked whether Mr. Smith had any evidence that it was connected with the presence of oxygen.

MR. SMITH answered that there was no such evidence at all.

MR. FRANCIS asked whether he thought adding oxide to molten cast iron was quite the same as the oxidation which might result from melting in a cupola.

Oxygen not Retained

MR. BACH, replying for Mr. Smith, said that he thought if the oxygen had gone into solution, that it was the same whether it had been added in the form of iron oxide or if it had gone in from the atmosphere, and they had found that if iron oxide was added to the cast iron, and if it was cast straight

away, the oxygen content was high, but if left for a short while it decreased. They felt that it was the same adding the oxygen either in the form of iron oxide or manganese oxide, as if it went into the solution from the oxygen in the air blast.

MR. HUNTER said he did not think that there was any relationship between the effect of the oxide and the effect of air blast.

MR. BACH said he would not like to be drawn into this question very deeply because the whole question was very much clouded by the fact that if oxygen were introduced over a long period such as from the air blast, it was not possible to keep the carbon and silicon content constant and if these varied, no conclusions could be drawn at all, and until a way could be found of melting in a cupola and keeping the carbon and silicon content constant, there was no real deduction possible.

MR. BAMFORD said within the last few months his firm had been reducing silicon and carbon content by bubbling oxygen through the metal. They had tried adding aluminium to counteract any deleterious effects, but had never found any difference, either in the composition or in the actual fracture of the metal, whether aluminium was added or not. Another circumstance experienced many years ago, was sub-cutaneous blowholes from $\frac{1}{16}$ in. to $\frac{1}{4}$ in. dia. The cause of the trouble could not be identified at first, but finally the reason was found to be in the steel scrap, which contained aluminium sheet, and as soon as this was eliminated, no repetition of this trouble was experienced. Mr. Bamford also referred to Mr. Smith's remarks that he found no variation in the iron oxide or oxygen content whether operating with hot blast or a cool blast, and he wondered whether any further information could be given on this.

MR. SMITH said in connection with the first point that they had recently tried to introduce oxygen by bubbling the gas through the melt, and they had not found any increase in the content of the metal due to the bubbling of the gas.

MR. BACH replied regarding hot and cold blast but he could make no helpful comment, all he could say was that he had visited several foundries where they were melting the same charge in the hot-blast and cool-blast cupolas, and took samples under exactly the same conditions, and there was the same oxygen content in both cases, but he would not like to try to explain the phenomena.

Interpretation of Results

DR. KONDIC said he had two points he would like to make:—(1) On the one hand there was presented a series of scientific details of gaseous metal data and on the other hand were practical foundrymen requiring assistance. He would like to know what was being done towards providing tests of metal which would tell grey-iron founders how many parts per million of gas were in the metal, so that they could make the proper deductions; and (2) cast iron being such a peculiar metal, he would like to know how much the Authors actually believed from the results at present available.

MR. SMITH replied on the second point that gas analysis had been carried out on samples mainly by chemical methods. He could safely say that only the nitrogen had been involved in any change. The chemical analysis on the complete series had shown no other change taking place.

MR. MORROGH replied regarding point one and said that Dr. Kondic had put his finger on a very important point and the work of practical application was only just beginning.

MR. PARNELL asked whether Mr. Smith could say in what form the oxygen existed in the iron.

Form of Oxygen

MR. SMITH said that oxidation had not been observed in micrographical examinations of the samples. The most probable form was in solution in the iron.

MR. BACH said another point which should be revealed was that the highest amount of oxygen they had been able to get into normal cast iron was about 150 p.p.m. If that were all combined with silicon it would only represent about 0.15 per cent. of silica, and this would not be noticed in the microstructure.

MR. HIRD referred to Mr. Bamford's point regarding blowholes and said by way of confirmation that he could remember an instance where aluminium was added to the ladles and this had caused blowholes. He would like Mr. Smith's remarks on this point.

MR. TAFT (the chairman) also referred to an instance where some scrap cylinder-blocks were charged whole into the cupola and the aluminium pistons included had caused a tremendous amount of scrap castings on that particular occasion.

MR. PARNELL said he had often witnessed cases where the direct addition of aluminium in the ladle had produced pin-holes in castings.

Aluminium and Blowholes

MR. BACH said he thought that it was fairly well known that aluminium could cause blowholes. There had been a number of cases where people had been using ferro-silicon, and when they had used this material, which also had a high aluminium content, they experienced blowholes in the castings, and with a lower aluminium content no blowholes resulted. At the moment it was felt that the most likely cause was hydrogen. It would be noticed that nothing much had been said about hydrogen, because at the moment they did not know anything very definite. Perhaps in another twelve months, he said, they might have more comments to make on these aspects. It had also been found that aluminium would eliminate blowholes and that it would neutralize the effect of nitrogen. The addition of 0.01 per cent. of aluminium to a metal containing nitrogen would give sound castings, but without aluminium the result was like a sponge. Therefore, he thought that aluminium was one of those things that could either cause or eliminate blowholes, and it appeared to be acting on different gases at different times.

MR. HIRD said he wondered whether the Authors would go so far as to issue a warning against the

use of aluminium additions, as being responsible for troubles of this nature.

MR. BACH said he thought the only thing that he could say was to try aluminium, and if it cured blowholes to carry on using it until the defect appeared again!

Changes in and after Melting

MR. MORGAN asked how the nitrogen content of iron was altered when it left the furnace, and whether an increase in gas pressure affected this.

MR. SMITH said that in the case of cupola-melted material, changes in blast pressure had been used without producing any marked change in the gas content of the metal melted, and that was about as much as he could say from the results so far obtained.

MR. DEWS said he was rather confused and not quite sure whether the object was to retain the gas or reject the gas. In his experience of melting irons, he said, the question of gases included from the cupola could be very serious, and sometimes on scrap analysis sheets, his firm could well have afforded to have had a separate category for scrap castings due to a gas defect. Over the years, an attempt had been made to try and locate what caused these gas defects. One of the first things which had been blamed was the type of steel which was being melted in the cupola mixture, and the theory was put forward that very "bad" scrap, having oxide rolled into the steel, could produce such a defect. One of the ways to minimize the defect was to reduce the amount of steel scrap in the charge, but over a period the quality of scrap had been improved, and serious consideration was in fact given to shot-blasting all the steel scrap used. However, on the one occasion a particular quantity of steel scrap had been shot-blasted, and this steel used in its entirety for one melt, this produced more "gassed" castings than an ordinary melt when using scrap straight from the storage bins!

A question he would like to ask was whether it was correct to say that if a casting showed a typical gas defect right throughout it, then the gas had arrived in the metal in the cupola melting operation. If, on the other hand, the items produced showed the defect only on a part of the casting, then was it fair comment to say that the gas had arrived in the castings either from the ladle, lining, or the moulding material? Following this line of argument, he and his co-workers had carried experiments to the stage of never using a mould that was not thoroughly dried; using synthetic sands with a high permeability; using ladles that had been well heated; pre-heating the runner from the tap hole; drying the cupola walls, and in effect eliminating every possible source of moisture that could occur from the charging to the finished castings, and while this particular casting defect had been largely minimized by such procedure, they did get occasionally a gaseous defect.

MR. TAFT said he disagreed slightly with what Mr. Dews had said in so far that he thought that it was not so much necessary to get rid of gases entirely, as to understand them more thoroughly and be able to control them.

MR. WRIGHT said that he felt that Mr. Bamford favoured the presence of oxygen and he himself was in sympathy with this idea and was certain there was beneficial action to be obtained from that element. For instance, oxygen injection was a good practice, which had been proved by long statistical analysis.

Effect of Casting Temperature

MR. CALLAGAN said that in casting a cylinder 12 in. dia. by 3 ft. long, in a suitable iron he could run it from the bottom or from the top, and the casting would be quite clean and free from blowholes, but if the job was made in a high-duty iron, he had to run from the top and run it with "very hot" metal. He would like to ask why it had to be cast very hot.

MR. BACH said he thought at this stage, and in considering gas content, the Authors were not at present very well informed in the actual production of castings apart from those about 3 in. long, and they had only been able to work on this subject for quite a short time. As yet it had been impossible to apply the results to practical work, and he was not therefore able to say why in the case stated the metal should have to be cast "hot."

MR. DEWS said he still was not clear as to the question of gases in cast iron, whether they produced gas holes or not. In his experience, gas that had been dissolved in melting metal finally got thrown out, which produced something more in the nature of a "tear," and that was the difficulty with which his firm was most concerned. In that respect he would like to comment on the fact that Mr. Callagan had found it necessary to cast "hot," for he had noticed that from any two ladles of identical iron they could cast two similar moulds, and if one were cast "very hot," very quickly it would produce more evidence of a gas defect than the other poured from the same metal after allowing it to go cooler. In the latter case, the gas defect was not so pronounced.

MR. SMITH said that in commercial irons any porosity caused would most likely be due to hydrogen; oxygen and nitrogen would probably be confined in a stable form. Allowing metal to stand for a period before casting would permit loss of a large amount of that gas.

Regarding the passing of oxygen through a melt, he would say that no increase in oxygen content of the metal had been found when this was attempted, but it was possible that elements could be removed by the treatment, for instance, graphite could be reduced.

Hydrogen Pick-up

MR. BAMFORD said he was rather sceptical of the theories expressed as to the influence of hydrogen. His company's furnaces were water cooled, and on one occasion the coolers had leaked and the

water ceased to flow through the effluent pipe, which meant that it was going into the furnace, but on that occasion no increase in gas content had been noticed, nor any fall in metal temperature, and there had been no gaseous castings.

MR. SMITH said that if in that case hydrogen had been introduced into the metal it was likely that there was sufficient time for it to escape again. It was certainly possible for it to be removed from hot metal.

MR. WAKEMAN asked whether a casting had been analysed that exhibited a gas defect. Further, was there less gas in such a casting when compared with another from the same melt, so that it could be said that the gas effect was less in one because the gas had escaped?

MR. SMITH said that, normally, experiments were carried out on specially-prepared samples, but certainly where porous castings had been analysed a variation had been found in the gas content, the porous sections having considerably more gas. There was, he said, some doubt as to whether the gas was evolved from the metal itself because of the greater surface involved in the casting where porosity existed, which itself might produce the higher gas contents recorded.

THE CHAIRMAN at this point had to bring the discussion to a close.

Junior Engineers' Meeting

The Iron and Steel Institute (Iron and Steel Engineers' Group) is organizing a meeting of junior engineers, to be held at Buxton on April 26, 27, 28 and 29; Mr. C. H. T. Williams, chairman of the Group, will be in the chair. The object of the meeting is to provide an opportunity for the younger engineers and operators in the iron and steel and associated industries to discuss engineering problems and visit works of interest; any members of the iron and steel and associated industries will be welcome at the meeting provided they are below the age of 35, whether they are members of the Institute or not. The Mayor of Buxton, His Grace the Duke of Devonshire, M.C., has kindly consented to dine with those taking part in the conference at St. Ann's Hotel, Buxton, on the evening of Monday, April 26.

The programme includes the presentation of Papers on "Starting-up an Automatic Repeating Hoop Mill," by Mr. D. W. Ainsbury (of Barrow Steel Works, Limited); "Installation and commissioning of Electrical Equipment associated with a Bessemer Convertor," by J. S. Reed (Consett Iron Company, Limited); "Erection and commissioning of a Large Combined Ingot-stripping, -charging and -drawing Crane," by W. D. B. Glass (Colvilles, Limited); and "Commissioning a Re-heating Furnace," by B. L. Nixon (Round Oak Steelworks) and A. Hunter (Stein & Atkinson, Limited). Tuesday and Wednesday are to be devoted to all-day visits to Davy & United Engineering Company, Limited, Sheffield, Park Gate Iron & Steel Company, Limited, Rotherham, The English Steel Corporation, Limited, Sheffield, and Steel, Peech & Tozer, Rotherham. On the final day there is to be a lecture on the "Iron and Steel Industry in the United States." Full details and registration forms are to be obtained by writing to the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1.

ELLIOTT BROTHERS (LONDON), LIMITED—Mr. J. G. Beevor has resigned from the Board.

Disappearing-filament Optical Pyrometers

The disappearing-filament optical pyrometer occupies an imporant position in the field of high-temperature measurement. In the metallurgical and foundry industries it is often used directly as the temperature-control instrument or as the reference standard for other instruments. It is thus important that these pyrometers should be capable of giving high accuracy and reliability. In order to make known the possibilities of improved design, the British Standards Institution has published a British Standard Code for these instruments (B.S. 2082).

The Code should prove useful both to manufacturers and users of optical pyrometers, for a wider field is covered than simple recommendations on design. The reasons for certain features of design, however, are fully discussed and this has led to the inclusion of a summary of the basic principles of optical pyrometry. In order to avoid digression from the main arguments, certain aspects of the subject are separated into appendices of which there are seven. The main text is divided into five parts under the headings:—(1) General (including definitions and a description of a typical optical system); (2) principles of optical pyrometry; (3) design requirements; (4) calibration procedure; and (5) selection and training of operators.

In part three, no rigid specifications are given but only an indication of the design requirements. Among the appendices there is for example a discussion on the precautions necessary in the use of optical pyrometers, including emissivity data and corrections to be applied to pyrometer readings; another of the appendices considers a scheme for the statistical assessment of observers, while a third sets out the method of calculation of the effective wavelength of the red glass of an optical pyrometer in some special cases in continuation of the discussion on this subject in the main text of the Code. Copies of this standard (B.S. 2082) may be obtained from the sales branch of the Institution, 2, Park Street, London, W.1 (price 6/-).

C.U.C./C.E.A. Conference

Following representations made by a number of owners and occupiers of property in the City of London, the Coal Utilisation Council and the Combustion Engineering Association, from a joint office at 6, Duke Street, St. James's, London, S.W.1, have organized a one-day conference entitled "Smoke Reduction in the City of London (Solid and Liquid Fuels)," to be held on Friday, March 26, at 10 a.m., at the Mansion House, London, E.C.4 (by kind permission of the Rt. Hon. the Lord Mayor of London). The object of the conference will be to show how the emission of smoke can be reduced by the right use and selection of fuels and appliances. Admission to the conference will be by ticket only and these can be obtained by completing and returning an application form to be obtained from the address quoted above. There will be an opening address by the Lord Mayor, Sir Noël Bowater and one by Capt. (E) W. Gregson, R.N.R., M.SC.(ENG.) (past-president of the Institution of Mechanical Engineers), who is chairman of the Advisory Committee on Fuel Efficiency to the Ministry of Fuel and Power. Thereafter, the main subjects covered will include: "available fuel," "smoke reduction in small and domestic appliances," and "central heating."

Book Reviews

Journal of Research and Development, Vol. 5, No. 4. Published by the British Cast Iron Research Association, Alvechurch, Birmingham.

There are five Reports in this issue. The first one—by Mr. W. J. Williams on the Influence of Casting Temperature on Chill and Mottle Formation—is of great practical importance for those who use chill tests as a means of metal control. The second Report by Mr. E. R. Evans and Mr. D. McK. Webster discloses the extent to which enamelled scrap can be used without detriment in cupola changes for making bath castings. Five per cent. is suggested as the limiting amount. Beyond this figure, there is danger from antimony, boron and lead which cause cracking. There are a dozen conclusions in Mr. Gilbert's Report on the Ductility of Whiteheart Malleable Iron, many of which are of great practical importance. Oxygen according to the penultimate Report from Mr. L. W. L. Smith does not appear to influence annealing time, but when aluminium is present, this annealing time is increased. The final Report by Mr. R. Jolly is on Segregation of Manganese Sulphide Type Inclusions in Grey Cast Iron. Here it would seem sand inclusions can enter into the picture. The manganese and silicon content influence the degree of attack on the moulding sand.

Breve Storia della Fonderia (Short History of the Foundry), by Dr. Gugliemo Somigli. Published by *Il Centro Fonderia*, A.I.M. 16, Via della Moscova, Milan, Italy. Price 1,000 lire.

The earlier parts of this 83-page, well-illustrated booklet have already appeared in the journal *La Fonderia Italiana*. The Author has dealt with both the theoretical and practical aspects of the foundry in a masterly fashion. The book opens with a sketch of the evolution of the art of foundry practice from its origin in prehistoric times, through the classic age, up to its decline during the middle ages, when the monk Theophilus gave, in *Diversarum Artium Schedula*, the first description of the lost-wax process. Then follows the story of the great development in foundry practice consequent upon the Renaissance, through the works of Biringuccio Verrochio, Leonardo da Vinci, Benvenuto Cellini, and others. Here the book "De la Pirotechnia," by Biringuccio—a fundamental work of reference on the subject—is analysed in some detail. In the later chapters, the Author describes the origin of the modern foundry from the works of Monge to Wilkinson's cupola; from the invention of Réaumur to steel-mix irons; the first moulding machines; the birth of mechanization and high-duty irons. A list of the more important Patents on cupola practice concludes this very interesting little book.

Basic Engineering Metallurgy, by Carl A. Keyser. Published by Macdonald & Company (Publishers), Limited, 16, Maddox Street, London, W.1. Price 60s. net.

This is an interesting book which will prove of value not only to students in metallurgical engineering but also to the practical engineer. The subject matter is divided into three main sections. The first deals simply and concisely with many of the metallurgical principles which affect the properties of metals and alloys; the second is concerned mainly with the effect of heat-treatment on the properties and structures of steel and also with the application and properties of some non-ferrous alloys, and the last part deals very clearly with the methods and processes available for forming finished articles from the cast metal.

The author in his treatment of the various subjects does not attempt to give elaborate descriptions or explanations of the various phenomena occurring in the treatment of metals, but presents the subject matter in a clear and concise form which serves to stimulate and maintain the interest of the reader. The text is illustrated by a large number of well-produced and well-chosen diagrams. The author has avoided the production of a catalogue of the properties of the various metals used in engineering practice and has concentrated on explaining the theories and principles which underlie the successful treatments to which metallic materials may be subjected. It is interesting to note that in his treatments of the various methods of fabrication he is careful to point out the effect of each particular treatment on the structure and the properties of the material considered. There is included at the end of each chapter a number of questions and problems which must prove most useful to the conscientious student. The book is strongly recommended.

R. H.

Non-ferrous Foundry Metallurgy. Edited by A. J. Murphy, M.Sc., F.I.M., published by Pergamon Press, 242, Marylebone Road, London, N.W.1, price £3 10s. (U.S.A. edition by McGraw Hill Book Company, Inc., 330, West 42nd Street, New York, 36.)

The various contributors to this volume are specialists in their respective fields, and have assembled much valuable data. It is likely that this will be, in the main, appreciated more by students of metallurgy than by foundry personnel, since the latter are accustomed to textbooks dealing with "know-how" rather than "know-why" in castings production.

The book is divided into seven main sections, dealing with various aspects of melting and solidification of non-ferrous materials and alloys, their properties, testing and production in the form of ingots and castings. Each section is adequate, though that devoted to magnesium might have included more information on the alloys containing zirconium, since these are now of major importance in aircraft castings production. The production and use of master alloys is of considerable foundry interest, but has not been included. Cupolas are seldom used in non-ferrous foundry practice, and could usefully be replaced in this book with a discussion of the rotary swarf recovery furnaces which find considerable application. Refractories are of greater importance in ferrous foundry practice than in the non-ferrous field, yet the fact that dolomite is largely used in the dead-burnt state should be made clear. An unfortunate impression is given that the problem of test-bar design has been solved, though limitations have appeared in the test-bar design recommended for tin bronzes.

Despite minor criticisms, the book is essentially sound. The photomicrographs of good and defective cast materials are a valuable feature, and good line drawings add to the usefulness of this clearly-printed and well-indexed volume. It is a welcome addition to the scanty literature dealing specifically with foundry metallurgy, and the editor and his contributors have attained a high standard in foundry literature.

CHRISTY & NORRIS, LIMITED, of Chelmsford, report that in purchasing the goodwill of the Canward Foundry they did not buy the premises. These have, in fact, been bought by another local engineering company and will not be used as a foundry.

New Equipment

Fordath Shell-moulding Machine

An assembly of shell-moulding equipment has now been produced by Fordath Engineering Company, Limited, Hamblet Works, West Bromwich, Staffs. As shown in Figs. 1 to 3, this is a two-stage machine which enables one man to maintain steady production of shell moulds utilizing two patternplates in turn for the purpose — one half shell being cured while the second is being prepared. A dump-box is placed centrally, flanked on either side by foot-operated stripping tables and curing ovens. The dump-box rotates on ball-bearings and is mounted on substantial cast-iron legs. Its movement is power-operated by means of a compact pneumatic cylinder through machine-cut mild-steel pinion and a malleable-iron quadrant; this, it is claimed, gives swift inversion of the box, resulting in accurate investment of the pattern. Foot-operated push-button control actuates the air mechanism and the dump-box automatically returns to its original position after a predetermined time interval. A B.T.H. electronic timing equipment is incorporated to ensure this accurate control of the investment period, accurate to one second between 0 and 60 secs. For fixing the patternplate to the dump-box positive clamps of the quick-acting toggle type are provided.

To hold the patternplates two bogies are arranged, into which the foundryman secures the plates. These bogies run lightly on lengths of track which lead directly to the back of the stove. Each bogie carries pivot arms which locate on the pivot brackets of the dump-box, so relieving the operator of the dead weight of the pattern when he inverts it on to the dump-box and also when the patternplate and "green" shell are removed.

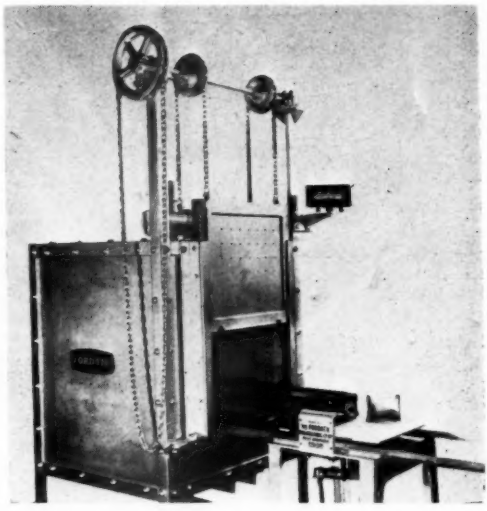


FIG. 2.—*One of the oven units; a patternplate mounted on its bogie is shown entering the oven.*

Available to make the equipment complete is a resin/sand mixer, capacity 80 lb., for ensuring perfect mixing of these ingredients. Special dust-seals are

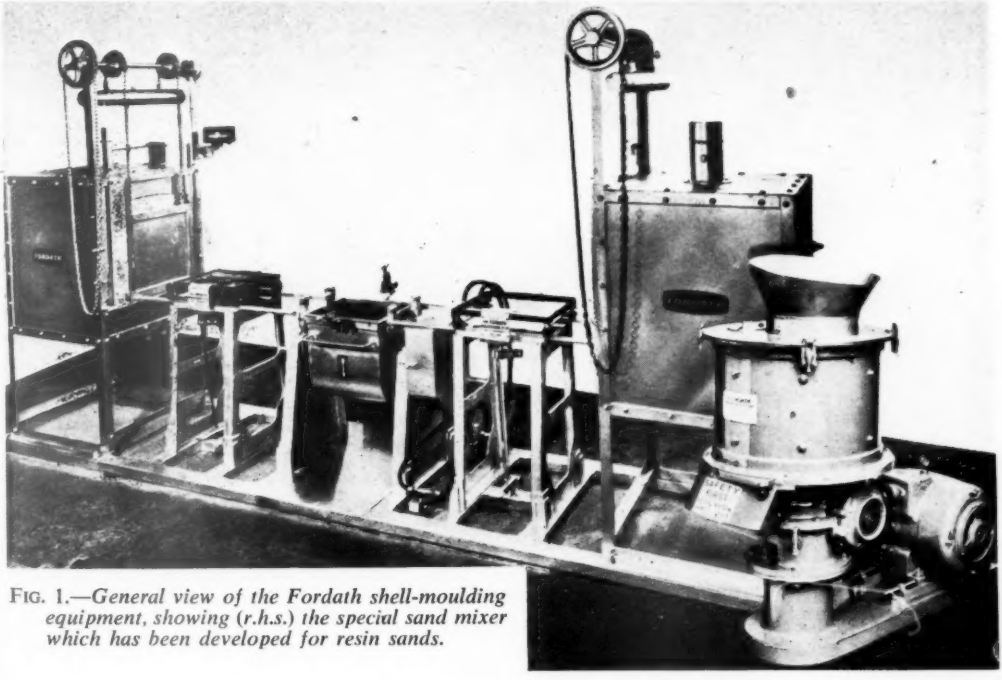


FIG. 1.—*General view of the Fordath shell-moulding equipment, showing (r.h.s.) the special sand mixer which has been developed for resin sands.*

FIG. 3.—*Half-shell being removed from its pattern-plate at one of the stripping stations.*

fitted to this and it is supplied complete with electrical equipment, as a self-contained unit. The mixer (model "Ca") is mounted on an independent bedplate and is driven by a 3-h.p. totally-enclosed motor, with a push-button starter. A particularly valuable feature is the rubber-sealed dust cover and segmental discharge door. For normal shell-moulding sand a mixing time of 6 min. is an adequate maximum and the complete mixing unit occupies a floor space of 3 ft. 9 in. by 1 ft. 10 in. by 3 ft. high.

Specification Details

The equipment as described caters for a pattern-plate 18 by 16 in. having an effective (biscuit) area of 16 by 14 in. and a productive capacity of approximately 40 shells per hr is claimed. The sand/resin capacity of the dump-box is 100 lb., at which content a 7-in. drop on to the patternplate is allowed. The amount of movement available for stripping is 1½ in. and for this purpose permanent bracket-type clamps automatically secure the plate firmly.

The two curing ovens have internal dimensions of 17½ in. wide, 22 in. deep and 12 in. high. Gas heating is used in conjunction with a remote-control valve, and a safety pilot light. The ovens are equipped with both a high-temperature thermostat and a 6-in. dial pyrometer indicator, with a range from 0 to 600 deg. C. (a recommended pyrometer setting is 350 deg. C.). In these ovens, 15 min. is the time required to heat a patternplate from cold to 250 deg. C. The floor space required for the whole equipment is approximately 14 ft. by 3 ft. 6 in. by 7 ft. 6 in. high.

Recent Wills

THORMAN, J. S., deputy chief engineer of the former Gas Light & Coke Company £4,426

WHIPPLE, R. S., formerly chairman of Cambridge Instrument Company, Limited, London, S.W.1 ... £84,025

HARRIS, A. E., a director of A. E. Harris & Company (Birmingham), Limited, agricultural and general engineers £12,339

HEYWOOD, S. H., founder and chairman of S. H. Heywood & Company, Limited, manufacturers of electric cranes, etc., of Stockport (Ches) £68,345

WILLIAMS, EZEKIEL, late manager of the Machynis foundry and engineering works and of Nevills foundry of Richard Thomas & Baldwins, Limited £6,022

STRABOLGI, LORD, former Labour M.P. for Central Hull, chairman of I. Bier & Son (Iron & Steel), Limited, London, E.C.2, and associated with other companies £5,286

SMITH, PROF. STANLEY PARKER, who was responsible for the design of many high-powered turbo-alternator sets when he served with Vickers, Limited, during the 1914-18 war £12,984

BOND, H. I. D., who was formerly divisional engineer for the Southern Railway, and chairman of Pike Bros. Fayle & Company, Limited, producers of refractory clays, of Wareham (Dorset) £9,705

FREESTON, T. E., formerly managing director of the Lilleshall Iron & Steel Company, Limited, Oakengates (Salop), at one time head of the steel-melting department of John Brown & Company, Limited, Sheffield £15,883

WHITTINGHAM, WILLIAM, a director of John Bradley & Company (Stourbridge), Limited, ironfounders, etc., and Harts Hill Iron Company, Limited, who was secretary of the Midland Iron and Steel Wages Board for 25 years £7,889

DYBALL, R. S., chairman of Hills (West Bromwich), Limited, engineers, and of Constructors, Limited, manufacturers of steel furniture, etc., of Birmingham, and a director of Lee, Howl & Company, Limited, pump and pumping-machinery manufacturers of Tipton, Darlington Wire Mills, Limited, Daniel Doncaster & Sons, Limited, drop-forgers, etc., of Sheffield, and of other companies £12,617

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade, Export Services Branch, Room 801, Lacon House, Theobalds Road, London, W.C.1 (telephone CHAncery 4411, ext. 738 or 771), unless otherwise stated.

HEMEL HEMPSTEAD (HERTS), March 20—Supply of heavy and light iron castings, cast-iron pipes and specials, sluice valves, wrought iron and steel tubes and fittings for the fiscal year 1954/55, for the Borough Council. Mr. A. R. Turner, borough engineer, Market Square, Hemel Hempstead.

NEWTON-LE-WILLOWS (LANCS), March 26—Supply of iron castings, manhole covers and frames, street gully covers and frames, for the year ending March 31, 1955, for the Urban District Council. The Engineer and Surveyor, Market Chambers, Newton-le-Willows.

STAFFORD, March 20—6,100 yds. of 9-in., 2,800 yds. of 4-in. and 3,200 yds. of 3-in. dia. spun-iron pipes, for the Rural District Council. Elliott & Brown, Stanley House, Pelham Road, Nottingham. (Deposit, £3 3s.)

INDIA, March 25—Oil-fired furnace, for the Directorate General of Supplies and Disposals, Government of India. (ESB/5714/54.)

INDIA, March 30—Pneumatic moulding machines, for the Directorate General of Supplies and Disposals, Government of India. (ESB/5632/54.)

Increases of Capital

BRITISH CASTORS, LIMITED, Birmingham, increased by £35,000, in £1 ordinary shares, beyond the registered capital of £25,000.

AVON DIECASTING COMPANY, LIMITED, Birmingham, increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

TAYLOR REID & COMPANY, LIMITED, ironfounders, etc., of Preston (Lancs), increased by £15,000, in £1 shares, beyond the registered capital of £5,000.

PIPES, LIMITED, selling agents of cast iron, gas and water mains, etc., of London, W.1, increased by £12,500, in 12,500 ordinary shares of £1, beyond the registered capital of £7,500.

Company News

BRUCE PEEBLES & COMPANY, LIMITED—Factory output increased by more than £500,000 to over £2,500,000, reducing total of orders in hand by 25 per cent., says the chairman, Sir William Darling. There is still considerable work in hand, he adds, and in the larger plant sections there is work ahead for several years.

MATHER & PLATT, LIMITED, electrical, textile, hydraulic, and fire-protection engineers, of Manchester —There was an improvement in regard to orders and contracts in the last few months of 1953. Consequently the company still has heavy order-books and no department is short of work. The full accounts for the year 1953 show an increase in the group's trading profit from £1,713,228 to £1,758,469.

BEANS INDUSTRIES, LIMITED, engineers and ironfounders, etc., of Tipton (Staffs)—Turnover in the year to November 30, 1953, says Mr. J. H. Bean, chairman, while again at a relatively high level, fell short of the exceptional figures of the previous two years, and a lower profit margin has operated. Trading profit in the year amounted to £306,610, compared with £451,082 in the previous year. He adds that turnover for the first three months of the current year compares favourably with the corresponding period of last year and the order-book is satisfactory.

ALFRED HERBERT, LIMITED, machine-tool manufacturers, etc., of Coventry—A final dividend of 7½ per cent. proposed by the company makes a 12½ per cent. tax-free distribution for the year ended October 31 last. This compares with a 5 per cent. final dividend to make 10 per cent. net for the previous 12 months, when there was also a special capital dividend of 15s. per cent. The year's net profit, after tax provision, amounts to £1,348,095 and compares with £1,186,254 previously. The 1953 profit, however, includes a credit of £133,323 for taxation over-reserved in previous years.

R. A. LISTER & COMPANY, LIMITED, agricultural, electrical, and general engineers, etc., of Dursley (Glos) —Although the volume of products manufactured and sold by the group in the year to September 30, 1953, established a record, profit, before tax, declined from £677,073 to £607,099. The chairman, Sir Percy Lister, explains that the group has been in the forefront of companies which have endeavoured to arrest the upward tendency in the cost of living by reducing their prices. The group net profit attributable to the parent company is £219,154, against £274,936, and the ordinary dividend is raised from 9 per cent. to 12 per cent.

DESOUTTER BROS. (HOLDINGS), LIMITED, manufacturers of pneumatic and electric tools, of London, N.W.9—Home sales for 1953 rose by approximately 12 per cent. over the previous year, and despite extremely competition conditions abroad, export sales were up by nearly 3 per cent. In his statement with the full accounts, Mr. G. H. Webb, the chairman, says that most of machine tools previously ordered for equipping expansion schemes have now been delivered, although some are not yet in full production. Replacement orders have become increasingly hard to obtain, he adds. In the absence of any unforeseen conditions, a reasonably satisfactory result for 1954 is expected. Total net tangible group assets have expanded from £929,565 to £1,018,012, of which fixed assets account for £230,748 (£170,456) and net current assets for £787,264 (£759,109).

Census of Production 1954

Ironfounders may recall that the Joint Iron Council, acting on behalf of the Council of Ironfoundry Associations, recently made strong representations to the official committee on the Censuses of Production and Distribution, for a lightening of the census on firms. This committee is still deliberating, and meanwhile the Board of Trade is making its usual preparations for the 1954 Census of Production. It is proposed that this shall be one of the most detailed yet issued, corresponding to the 1951 census in respect of output, and the 1948 census in respect of materials and fuel. In the latter section some changes have been made and a few items have appeared which have not been contained in any previous census.

The C.F.A. has objected strongly to these proposals in an official letter to the Board of Trade. The following quotation may help to acquaint founders with the general character of the objections:—

"This Council considers that it is most undesirable for the Board of Trade to proceed with this detailed form of census for ironfoundries while the report of the committee on the Censuses of Production and Distribution is awaited. Our industry and many others have made the strongest objections to this type of census, and we consider that this heavy burden should not be imposed upon ironfounders, and certainly not until future Government policy has been established."

The letter goes on to recommend that a summarized type of census should be planned until future policy is determined, and also makes objection to specific features in the draft census form.

Conference for Small Firms

Small companies in every district of the country should form groups to pool expenses in getting technical consultants for their factories, Mr. W. Robson-Brown, M.P. for Esher, suggested at a conference for small firms held recently at Ashorne Hill and organized by the British Institute of Management. The groups would also be able to use their pooled finances for combined export sales. Mr. Robson-Brown also suggested that immediate consideration should be given to the erection of a permanent industrial exhibition near London Airport, financed by the Government or by private subscription. The exhibition would be open all the year and would be specially designed to give cheap and efficient display facilities for small firms.

"Visit your markets, use the buyer's language in correspondence, and give rapid delivery" was the advice to British exporters given at the conference by Mr. J. Davis, chairman and managing director of Suntex Safety Glass Industries, Limited. He told the conference that some exporters attempted to conduct their export sales by a system of remote control, under the mistaken impression that the whole question could be tackled effectively from behind a desk. This attitude was responsible to a considerable extent for the loss, or lack, of expansion of foreign trade, he said.

Manual Lifting and Handling

Last week, the Industrial Welfare Society, in association with the Central Council of Physical Recreation, held a week-end course on "Manual Lifting and Handling" at the Lilleshall Hall (national recreation centre), near Newport, Shropshire. Among the tutors was Mr. George Hickling, a technical representative of C.C.P.R., who recently addressed the foundrymen's safety conference at Ashorne Hill.

Personal

MR. A. ROBERTSON, general manager of the Worcester works of Alley & MacLellan, Limited, makers of compressors and vacuum pumps, has been appointed managing director of the company.

MR. KENNETH HORNE, of B.B.C. fame, who is sales director of the Triplex Safety Glass Company, Limited, has been elected vice-president of the Institute of British Carriage and Automobile Manufacturers.

MR. JOHN V. SPENLOVE BROWN, A.M.I.MECH.E., has been appointed technical sales manager of Visual Planning Systems, Limited, Alperton, Middlesex, precision patternmakers and machinists and manufacturers of three-dimensional factory planning equipment.

MR. S. S. SEABROOK is joining the group of companies headed by Dowty Equipment, Limited, as publicity manager in April. He comes from Ruston & Hornsby, Limited, Lincoln, with whom he has served as advertising and publicity manager for the past 10 years.

MR. R. TURNBULL has been appointed bitumen manager, eastern division, and MR. H. W. HASTINGS fuel oil manager, northern division, of Shell-Mex & B.P., Limited. MR. A. A. HENDERSON has been appointed branch manager, Dundee, Scottish Oils & Shell-Mex, Limited.

KEITH BLACKMAN, LIMITED, announce that MR. M. BURNINGHAM is relinquishing his office as joint managing director as from April 1. He will, however, remain chairman of the company. MR. D. S. WOODLEY has been appointed managing director of the company with effect from the same date.

NOW THAT he has recovered from his recent illness, involving a surgical operation, MR. W. E. ASKE is shortly to be the recipient of a presentation from the staff of his Company to mark the golden jubilee of the firm—Wm. Aske & Company, Limited, of Halifax—the ceremony having been postponed.

MR. C. M. SMITH, of Peglers, Limited, Doncaster, was re-elected president of the Northern Employers' Brassfounders' Association for a second year at the annual meeting on March 10. MR. A. CREIGHTON was elected to the Executive Council to take the place of Mr. A. Thomson, a retired director of Bells Asbestos Company and W. N. Baines & Company, Limited, Rotherham, who resigned.

MR. ARCHIBALD BAIN, of Perth, has been appointed general manager of the Bren Manufacturing Company, Limited, Gateshead-on-Tyne. He was formerly secretary and is the youngest man to take up the post for many years. After service with the R.A.F. during the war, he joined the firm of Aveling-Barford, Limited, engineers, Grantham, and in August, 1949, went to the Bren Manufacturing Company as production control manager and was later promoted commercial manager, and then company secretary.

MR. OMER G. VOSS has just arrived in London from Australia to take up the appointment of assistant managing director of the International Harvester Company, Limited, of Great Britain. Mr. Voss is an American and joined the company in 1936 in the accounting department. After various assignments in the accounting, collection and sales departments, he was appointed assistant district manager, Oakland, California, in 1946. In 1949 he was appointed manager of the International Harvester works at Stockton, and in 1951 became assistant managing director of International Harvester Company of Australia Pty.

MR. G. W. ROSE has been appointed works manager of the car division of the Austin Motor Company, Limited. Mr. Rose, who is 38, has been assistant director of wheeled vehicle production with the Ministry of Supply (Fighting Vehicles Division) since 1951. He will take up his new appointment immediately. Mr. Rose served his engineering apprenticeship with Wolseley Motors, Limited, of Birmingham. He rejoined Wolseley Motors Company after the war as production co-ordinator and became personal assistant to the director and general manager in 1948. He was production controller of Morris Motors' tractor and transmission branch from 1949-51 and in July of that year was seconded to the Ministry of Supply.

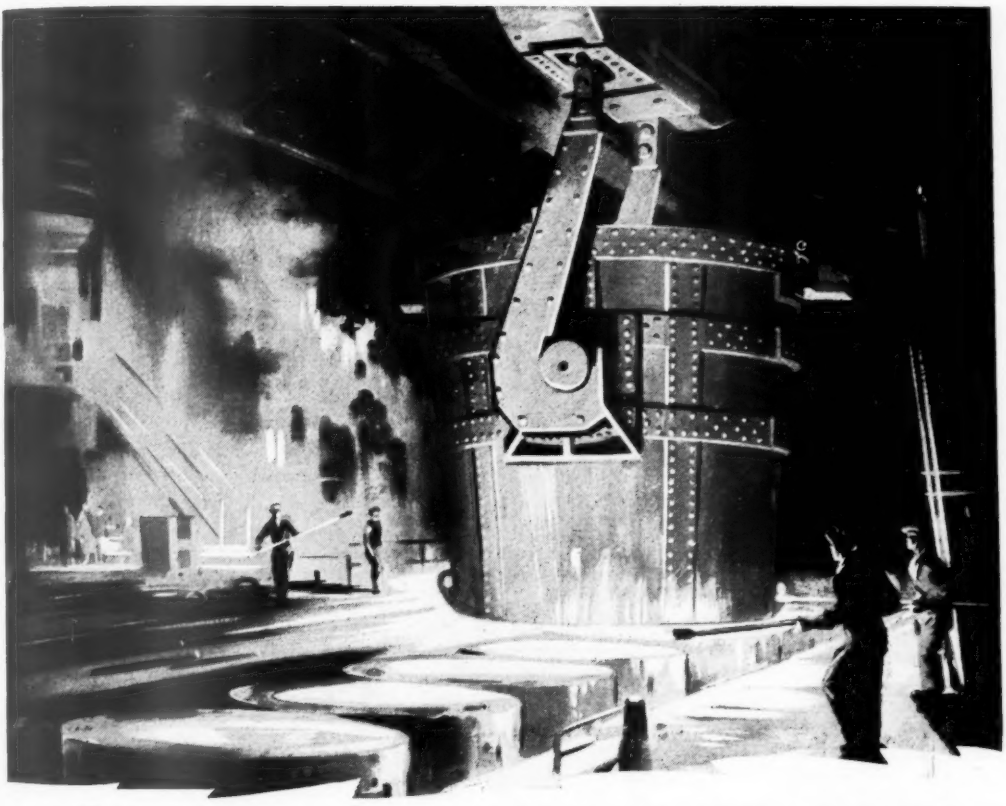
AFTER A seven-year business assignment in Australia, MAJOR JOHN P. H. DAWSON has returned to Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, and has been appointed personal assistant to the managing director, Sir Harold West, who, earlier this year, assumed the further appointment of vice-chairman of the company. Major Dawson's appointment is particularly interesting because it means that once more the Dawson family will be associated with the firm. He is the great-great-great-grandson of Thomas Chambers, who, with George Newton, founded the Thorncliffe company in 1793. Major Dawson, who is a chartered accountant, is the nephew of Mr. C. W. Dawson, who was a member of the board of Newton Chambers for nearly 50 years.

Obituary

MR. DAVID G. BISSET, well-known in Scottish ironfounding circles, died on March 12. He came south to Derbyshire in 1925 and thence to London, where he founded, with his son, the Enfield Foundry Company, Limited. He was in active business up to 1940 when he retired to Berwick-on-Tweed. He was in his 89th year.

THE DEATH has occurred of MR. F. DUNLEAVY, a well-known foundry manager, of Lancashire extraction. He joined the Institute of British Foundrymen in 1929, and was throughout his membership extremely active. He presided over the East Midlands branch in 1945-46 and for his technical contributions to the Institute received a diploma. He was also active as a member of the Technical Council and latterly in the Lincoln branch, of which he was the first president. He was foundry manager since 1946 of Harrison & Company (Lincoln), a subsidiary of Ley's Malleable Castings Company, Limited. Earlier, he was with Worthington Simpson & Company, Limited, of Newark, where he collaborated with Mr. Harbach in preparation of technical papers.

MR. JOHN CHESTER SIMON, of Chesterfield, founder-director of Robert Hyde & Son, Limited, ironfounders, Chesterfield, died at his home on March 6, aged 74. A native of Lincolnshire, he first became associated with the firm many years ago, and when it became a limited company in 1910 he was appointed a founder-director. He was the first company secretary and a life director, and moved from Sheffield to Chesterfield when in 1917 the Chesterfield branch of the firm was formed. At the same time other works were opened at Stoke-on-Trent. From 1942 until he retired last year he was chairman of the Cast Iron Axlebox Association, and among other interests he was a member of the Institute of British Foundrymen since 1932 and of the Ironfounders' National Confederation.



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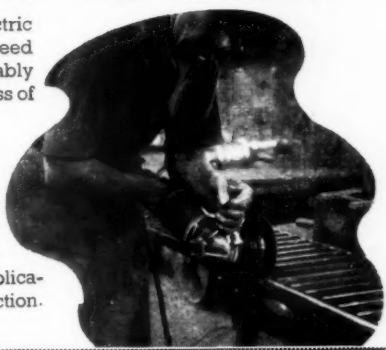
Hicycle tools should not be confused with ordinary 50-cycle electric tools. Operating instead on 200 cycles they develop a motor speed which is sustained under all operating loads. This means measurably more work in a shorter period, and although possessing the toughness of air tools their operating costs are considerably lower. Moreover, Hicycle tools are safe, only 125 volts or 72 volts to earth.

Hicycle is accepted as THE modern production system wherever drilling, reaming, tapping and grinding operations are carried out on any scale. In fact, Hicycle should be investigated wherever there are more than two or three power tools in use.

The Foundry Industry is one of the many fields in which Hicycle has proved its power to increase output and lower costs. Write for publication S.P.354 as a first step to increasing the efficiency of your production.



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News in Brief

THE STEEL, PEECH & TOZER branch of the United Steel Companies, Limited, announce that Mr. P. Beynon will be appointed manager of the newly-formed work-study department.

ON MARCH 25, the northern-area organization of Birlec, Limited, is moving from 63, Arundel Street, Sheffield, to new offices at 317, Glossop Road, Sheffield, 10 ('phone: Sheffield 63258-9).

L. LIGHT & COMPANY, LIMITED, of Poyle Estate, Colnbrook, Bucks, announce the publication of their 1954 catalogue and price list or organic research chemicals, which is available to research workers on request to the address quoted.

RECENTLY, the new Allendale Works at Crawley New Town, Sussex, of W. Edwards & Company (London), Limited, was opened by Sir Ben Lockspeiser, K.C.B., Secretary to the Department of Scientific and Industrial Research.

PIONEER of a revolutionary era in aviation, Britain's first aero jet engine will occupy an honoured place at Olympia for the 1954 British Industries Fair to be held from May 3 to 14. The engine is universally regarded as "a shining example of British inventive genius."

F. & M. SUPPLIES, LIMITED, 4, Broad Street Place, London, E.C.2, announce that they have appointed G. Pennington & Sons, Limited, 300-303, The Exchange, Mount Stuart Square, Cardiff, Glam; to act as their representatives in South Wales and West of England.

RANSOMES SIMS & JEFFERIES, LIMITED, on stands 1317/1216 (outdoor) and A.502 at the British Industries Fair, Castle Bromwich, will include a range of petrol-driven tractors, battery-operated fork-lift trucks and ancillaries. Indoors, the company's various models of grass-cutters will be on view.

THE NEXT STEP in the work of the Recruitment, Training and Education Committee of the Council of Ironfoundry Associations is the appointment of a training officer. As the training officer's salary is to be paid from Conditional Aid funds already allocated, it creates no additional financial burden to be borne by the C.F.A.

THE HOPE that other firms would be induced to examine and exploit some of Scotland's other natural resources was voiced by the Earl of Home, Minister of State, Scottish Office, when he opened a new factory constructed by the Cape Asbestos Company, Limited, at Stirling on March 6. The new works will manufacture "Rocksil," a long-fibre rock wool for heat, cold, and sound insulation.

A SPRING BALANCE, 12 ft. high, weighing more than 6 tons, and designed to take weights up to 200 tons, will be the "highlight" of exhibits which Geo. Salter & Company, Limited, of West Bromwich, will display on three separate sands (D.343/238, D.328, and A.407/306) at the Castle Bromwich (Birmingham) section of the British Industries Fair. Grey-iron castings will be included on stand D.343/238.

THE BRITISH INSTITUTE OF MANAGEMENT, in association with the regional organizations of the Federation of British Industries, the National Union of Manufacturers and the Institute of Industrial Administration, has arranged a conference at Southport from April 2 to 3 to provide firms in the north-western region with an opportunity for discussing their most pressing management problems.

SPEAKING at the annual meeting of the Chesterfield and District Foremen's Association recently, the newly-elected president, Mr. R. T. Redfern, managing director of Bryan Donkin Company, Limited, referred to problems confronting employers regarding the insufficient numbers of apprentices available, particularly for foundrywork. He advocated that managements should endeavour to improve conditions and make the lot of the apprentice more attractive.

HIS COMPANY was determined to standardize on its present range of equipment, Mr. Alex Frazer, vice-chairman of Girling Brakes, Limited, told colleagues and guests at the company's annual dinner in Birmingham. Standardization was the lifeblood of the British motor industry, he said, because it purged the system of all excess costs. Only by standardization could foreign competition be overcome. Leading representatives of the motor industry in this country and from overseas attended the dinner.

IN A Lambeth foundry undergoing repair and cleaning is a statue of Eros which is a replica of the famous Piccadilly statue. It belongs to Sefton Park, Liverpool, and was a gift to the city by a Liverpool man twenty years ago. Like the London Eros, it is made of aluminium, and a recommendation to the Liverpool City Authority that it should be cleaned came from Dr. E. G. West, technical director of the Aluminium Development Association, who in the past advised the London County Council on the cleaning of the original statue.

THE GENERAL ELECTRIC COMPANY, LIMITED, are displaying a wide variety of switchgear, measuring instruments, installation material and similar products at this year's exhibition of the Association of Supervisory Electrical Engineers at Earls Court, London, on March 16 to 20. Among the accessories displayed will be a weatherproof rotation switch for safeguarding conveyor systems, "Litealarm" equipment for providing visual and audible warnings in hazardous atmospheres, and a fire-alarm system, which incorporates visual signals and telephones.

DR. W. G. THOMPSON, manager of the G.E.C. research laboratories, has been appointed chairman of a provisional steering committee set up by the Midland Group of Presentation of Technical Information. One of the group's objects is the exchange of technical information and its presentation to non-technical people in plain language. The joint honorary secretaries of the Group are Mr. P. D. Patterson, of the Dunlop Research Centre, and Mr. H. P. Compton, of the Department of Industrial Administration, Birmingham College of Technology.

A NET INCREASE of 232 members during the past year was reported by the retiring president (Mr. G. N. Swayne, M.I.SAN.E.) at the inaugural meeting for 1954 of the Society of Engineers (Incorporated), which is entering its centenary year. Mr. Swayne handed over the Society's 50-year-old gold and enamel presidential badge to Mr. Walter R. Howard, a vice-president and hon. treasurer, who has been a member of the Society since 1917 and is also a member of the Institution of Structural Engineers and is British hon. secretary of the *Société des Ingénieurs Civils de France*.

AS PREVIOUSLY ANNOUNCED, British Moulding Machine Company, Limited, Weston Works, Faversham, Kent, are again exhibiting at the American Foundrymen's Society convention and show to be held in Cleveland from May 8 to 14. On the stand (No. 1428 in Lower Lakeside Hall) two types of B.M. machines are being shown, one of which is equipped with a pneumatically operated swing arm and all equipment for automatic mould removal. Both Mr. V. L. Cashmore and Mr. H. J. Bullock will be attending the show, together with their American representatives.

(*Continued on page* 318)

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FS/14

News in Brief

(*Continued from page* 316)

VICKERS-ARMSTRONGS, LIMITED, announce that they have received an order from Canadian Pacific Steamships, Limited, for a 22,500-ton passenger and cargo liner, which will be built at their shipyard at Walker near Newcastle-upon-Tyne. The new liner will cost more than 15 million dollars and is one of the largest dollar orders to be received by a British company in recent years. The machinery, which will consist of D.R. geared turbines to be built at Vickers-Armstrongs, Barrow, has been designed to develop a maximum of 30,000 shaft horsepower, giving a service speed of 21 knots.

SPECIAL ATTENTION at the stand (C.601) of Higgs Motors, Witton, Birmingham, 6, at the British Industries Fair, Castle Bromwich, will be drawn to the firm's new range of totally-enclosed fan-cooled motors designed in accordance with British Standard CN (Ele) 6814, and to the enlarged range of single- and three-phase self-regulating generators, which have been designed for operation without the use of an automatic voltage regulator. In addition, standard and special motors representative of the company's comprehensive range of rotating electrical machinery from $\frac{1}{8}$ to 1,000 h.p. will be exhibited.

THERE WILL AGAIN be an official United Kingdom stand on the first floor of the Palace of Nations at the forthcoming International Samples Fair to be held in Milan from April 12 to 28. This decision was made in view of the very considerable interest shown in last year's display, which featured the "atomic pile." The main feature of the British display this year will be taken from the United Kingdom aircraft industry. This will show the advance made by the industry over the years, and will emphasize that British manufacturers are continuing to pioneer with new types of aeroplanes of new shapes and with new methods of propulsion.

IT IS REPORTED that the two brothers, Mr. R. H. Butterfield and Mr. W. P. Butterfield, of the Shipley firm of W. P. Butterfield, Limited, engineers and tank manufacturers, left in the Queen Mary during the week-end for a six-week tour of Canada, where they intend to look for a suitable site to erect a factory in Canada for the production of similar equipment to that manufactured in Shipley. Mr. John Pearson, one of their Shipley associates, has been in Canada already several weeks surveying the possibility of a site. The Butterfields both feel there are tremendous business opportunities in Canada. They are expected back in England about the middle of April.

TO LIGHT the 4½-acre factory of Ferranti, Limited, Hollinwood, Lancs, a Metrovick, 8-ft., 125-w., hot-cathode scheme has been adopted. The equipment was planned for an average of 15 lumens per sq. ft. and 1,800 lamps are used, mounted in heavy-gauge metal-trough reflectors with upward light slots. Each unit has a separate 3-pin plug and socket to enable the maintenance staff to remove or replace any fiting quickly for cleaning or overhaul. Installation has been spread over a period of three years and sufficient time has now elapsed since the first section was completed to judge it under actual operating conditions. It is reported to be up to the most optimistic expectations.

AT A MEETING of the Midland Scrap Iron, Steel and Metal Association, on March 11, it was emphasized that although the official scrap-metal drive has ended, there must be no letting-up by merchants in their efforts to obtain every possible ton of metal scrap. Home-produced scrap, it was stated, could never be sufficient to supply the needs of the steel industry. The Midland Association is pressing the Ministry of Supply to revoke the control on cast-iron scrap. It is also opposed to special authorization granted to certain foundries to buy cast-iron scrap above the controlled price and disputes the Ministry's view that these purchases form a small percentage of the whole. Mr. F. Allen Rowland, of Birmingham, was elected president of the Association, and a cocktail cabinet was presented to Mr. F. W. G. Church, who had been president for the past two years.

ON JULY 3, Birmingham University is to confer honorary degrees on Sir Harold Roxbee Cox, chief scientist to the Ministry of Fuel and Power, and Sir John Douglas Cockcroft, Britain's atomic energy chief. Changes affecting the Department of Physics and Theoretical Metallurgy at Birmingham University were announced by the University Council on March 9. In future it will be known as the Department of Physical Metallurgy and Prof. A. H. Cottrell, Professor of Physical Metallurgy, and Prof. C. V. Rayner, Professor of Metal Physics, are to be its joint heads. The Feeney Chair of Metallurgy, formerly held by Prof. D. Hanson, who died in June last year, is not to be filled at present. Prof. Hanson was also director of the combined departments of metallurgy, a position now occupied by Prof. A. F. Murphy, who holds the Chair of Industrial Metallurgy.

MARRIED WOMEN make up 43 per cent. of the total working female population and number more than 3,000,000; this is a considerable proportion and with it must be reconciled industry's needs and the married woman's desire to work and care for her home at the same time. In its pamphlet, "Married Women in Industry," the Institute of Personnel Management concludes that part-time work offers the happiest solution. Many companies realize, the pamphlet says, that the older woman especially, with her record of good health, is a reliable and conscientious employee and that the advantages of maturity frequently outweigh those of youth, but companies often find it difficult to reconcile shorter hours with production needs. The main disadvantages of employing married women are their high labour turnover rates, high absence rates, the need to provide welfare facilities and to grant special leave when necessary, and the women's lack of ambition to take supervisory responsibility.

THE OWNERS of a 114-year-old West Bromwich iron-foundry are considering stopping production next year because they are finding the business uneconomical to run. The firm is Charles Akrill & Company, Limited, Golds Green, where over 100 workers have been warned of the move, and although some have been offered a transfer to the firm's Crewe headquarters, where houses will be provided, others will lose their jobs. Compensation will be paid. Key workers who turn down the offer of a move to Crewe will receive compensation. Mr. W. H. Lewis, managing director of the firm, which is a subsidiary of British Roll Makers' Corporation, Crewe, said this week that the Crewe works were built to replace out-of-date plants and were planned to cater for expansion, which was impossible on existing sites, and to concentrate production in a single economic unit. It was, and still is, he said, the policy of the company to operate the Midland plants as long as it was a sound economic policy. "However, a return to a more normal level of purchasing after the boom conditions of the war has made it necessary to envisage transferring the Akrill production to Crewe at an earlier date than was anticipated," Mr. Lewis said. He added that the name of Akrill was to be kept on for the time being, and the firm had not yet decided what was to happen to the West Bromwich premises.

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236/56

Raw Material Markets

Iron and Steel

Blast-furnace raw materials are being received in ample tonnages and the pressure of demand for pig-iron is such that the rise in prices has not affected the prompt clearance of supplies. Conditions in the light foundries are variable, but these establishments are generally much busier than they were towards the end of last year, and their requisitions for No. 3 foundry pig-iron are on a much better scale. The engineering foundries are fully employed and experience difficulty at times in obtaining the special grades of iron they require for their cupola mixtures.

Re-rollers have abandoned export premiums and are offering small bars for export at the same price as for home deliveries, only to discover that they are still being under-sold by European exporters. The position of the bar re-rollers is thus very difficult, though home requirements have registered a slight improvement. There is only a limited demand for billets, but the boom in the sheet trade is reflected in an increased call for sheet bars and slabs.

The outstanding feature of the finished steel trade since the turn of the year has been the phenomenal demand for sheets. It is true that an expanding output of plates has not yet attained such proportions as to enable the immediate satisfaction of all requirements, but the gap between supply and demand has been narrowed considerably. In regard to sheets, however, that gap is widening. Superimposed upon an active home business, sheetmakers have taken up substantial export orders. Argentina was first in the field. Shipments to Australia and New Zealand have also been arranged and more recently American inquiries have been in circulation. The net result is that export quotas for the first half of the year are now fully taken up. The rail mills are also fully employed, but the position in regard to heavy sections and joists is easier.

Non-ferrous Metals

Figures published by the British Bureau of Non-ferrous Metal Statistics for the month of January show that the year made a fairly good start in all four metals. Moreover, stocks showed a rising tendency, which is all to the good in view of the fact that a backwardation rules in all four metals on the Exchange. Stocks of copper, for example, rose by about 5,000 tons to 60,402 tons at January 31, while stocks of zinc went up from 27,652 tons to 35,411 tons. Our reserves of virgin lead advanced to 32,653 tons from 26,887 tons a month earlier. Consumption of copper, at 42,902 tons, including secondary, was about 700 tons up on December, but usage of zinc, at 25,615 tons, was fully 1,000 tons lower than in December. Lead also lost ground, the January figure of 25,786 tons comparing with 26,582 tons a month earlier. Tin consumption, at 1,663 tons, was about 100 tons down, but stocks, at 3,530 tons, were 445 tons up.

On the whole, last week was a good one for holders of metal, for there was an all-round advance, zinc being the only laggard. Prices were up in the United States, zinc by ½ cent to 9¾ cents and lead by ½ cent to 13 cents. The supply and demand situation in lead seems to be more in alignment, and it is felt that there may well be less selling pressure on the London market. Tin made a flying start to the week by a jump of £25 in the cash price due to the "benevolent" attitude adopted by the U.S. Government to the tin restriction scheme, which, it is felt, now has a fairly good chance of being adopted. But the American Government is not prepared to sign, and consumers there are against the plan. However, there is not likely to be any selling pressure from the U.S. stockpile surplus, and that is encouraging. Unfortunately, it looks as if France may also not be a signatory.

Tin ended the week with another burst of strength on Friday, based on news that the U.S.-Indonesian contract had been renewed. On the week cash gained £5 and three months £41 10s. Copper, after touching £241 for cash, closed at £239 10s., a gain of 30s. on the week. Three months put on 35s. Zinc closed 15s. up for March and 25s. better for June, while lead improved by £3 5s. and £3, respectively.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* March 11, £239 to £241; March 12, £238 to £239; March 15, £237 10s. to £238 10s.; March 16, £232 10s. to £233; March 17, £233 10s. to £234 10s.

Three Months: March 11, £227 15s. to £228 5s.; March 12, £226 15s. to £227; March 15, £226 5s. to £226 15s.; March 16, £224 5s. to £224 10s.; March 17, £224 10s. to £225.

TIN, Standard—*Cash:* March 11, £712 10s. to £715; March 12, £730 to £735; March 15, £725 to £735; March 16, £724 to £726; March 17, £725 to £730.

Three Months: March 11, £685 to £686; March 12, £693 to £694; March 15, £692 10s. to £695; March 16, £679 to £680; March 17, £680 to £685.

ZINC—*March:* March 11, £73 15s. to £74; March 12, £73 to £73 5s.; March 15, £73 5s. to £73 10s.; March 16, £73 to £73 5s.; March 17, £73 5s. to £73 7s. 6d.

June: March 11, £72 15s. to £73; March 12, £72 5s. to £72 10s.; March 15, £72 5s. to £72 10s.; March 16, £72 5s. to £72 10s.; March 17, £72 5s. to £72 10s.

LEAD—*March:* March 11, £88 to £88 5s.; March 12, £86 5s. to £86 10s.; March 15, £86 5s. to £86 15s.; March 16, £84 15s. to £85 5s.; March 17, £85 10s. to £85 15s.

First half June: March 11, £87 5s. to £87 10s.; March 12, £85 to £85 5s.; March 15, £85 5s. to £85 15s. *Second half June:* March 16, £83 10s. to £83 15s.; March 17, £84 5s. to £84 10s.

Board Changes

RADIATION, LIMITED—Dr. H. W. Melville has been elected a director.

CHAMBERLAIN INDUSTRIES, LIMITED—Mr. L. R. H. Bell has been appointed a director.

BIRFIELD INDUSTRIES, LIMITED—Mr. W. R. Black has been appointed an additional director.

INDIAN IRON & STEEL COMPANY, LIMITED—Subramanya Bhoothalingam has joined the board.

PATERSON ENGINEERING COMPANY, LIMITED—Capt. W. M. H. Pollen and Mr. J. A. Kinnaird have resigned from the board.

ALMEX RECOVERY & REFINING COMPANY, LIMITED—Lord Wilmot of Selmeston has joined the board and been appointed chairman.

BAKER PERKINS, LIMITED—Mr. G. A. Lemons, works director for the past three years, has resigned on taking up a new appointment.

STAVELEY COAL & IRON COMPANY, LIMITED—Mr. M. Frogatt, the secretary, has been elected to a seat on the board. He has been connected with the company for over 30 years and is already a director of several of the company's subsidiaries.

AUTOMOTIVE PRODUCTS ASSOCIATED, LIMITED—Mr. A. C. Burdon, Mr. N. C. A. Spurgeon, and Mr. E. W. Swales have been appointed deputy managing directors. Mr. E. Beaumont has been appointed production director, Mr. S. M. Parker engineering director, and Mr. S. Westwood Smye purchasing director. Mr. J. B. Emmott has been appointed to act as an alternate director to any member of the board.